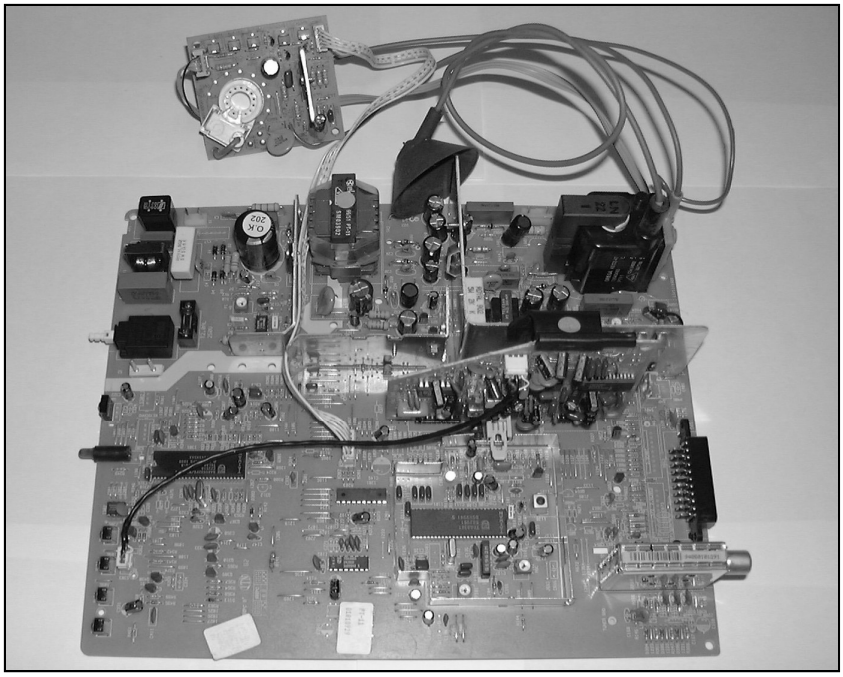
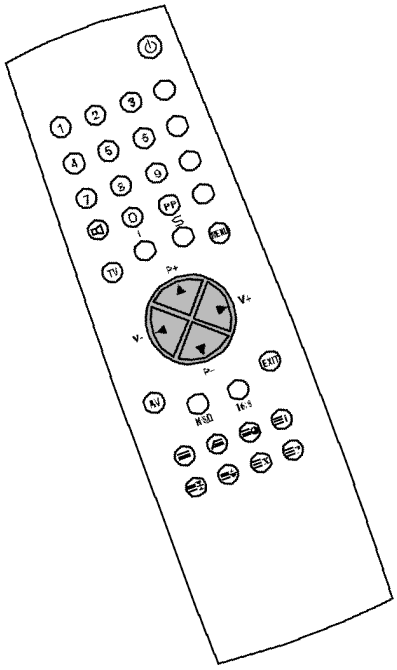
SERVICE MANUAL

PT-11 PAINTER CHASSIS





Modification reserved

CONTENTS

RECOMMENDATION FOR SERVICE REPAIRS

1- Use only original spare parts. Only use components with the same specifications for replacement.
2- Original fuse value only should be used.
3- Main leads and connecting leads should be checked for external damage before connection.
Check the insulation.
4- Parts contributing to the safety of the product must not be damaged or obviously unsuitable.
This is valid especially for insulators and insulating parts.
5- Thermally loaded solder pads are to be sucked off and re-soldered.
6- Ensure that the ventilation slots are not obstructed.
7- Potentials as high as 25 KV are present when this receiver is operating. Operation of the receiver outside the cabinet or with back cover removed involve a shock hazard from the receiver.
Servicing should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment.
Perfectly discharge the high potential of the picture tube before handling the tube. The picture tube is highly evacuated and if broken.
Glass frogments will be violently expelled.
Always discharge the picture tube anode to the receiver chassis to keep of the shock hazard before removing the anode cap.
8- Keep wire away from the high voltage or high temperature components.
9- When replacing a wattage resistor in circuit board, keep the resistor 10 mm away from circuit board.

HANDLING OF MOS CHIP COMPONENTS

MOS circuit requires special attention with regard to static charges. Static charges may occur with any highly insulating plastics and can be transferred to persons wearing clothes and shoes made of synthetic materials. Protective circuits on the inputs and outputs of mos circuits give protection to a limited extend only due to time of reaction.

Please observe the following instructions to protect the components against damage from static charges.

1- Keep mos components in conductive package until they are used. Most components must never be stored in styropor materials or plastic magazines.
2- Persons have to rid themselves of electrostatic charges by touching MOS components.
3- Hold the component by the body touching the terminals.
4- Use only grounded instruments for testing and processing purposes.
5- Remove or connect MOS ICs when operating voltage is disconnected.

X-RAY RADIATION PRECAUTION

1- Excessive high voltage can be produce potentially hazardous X-RAY radiation. To avoid such hazard, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is 25KV at zero beam current (minimum brightness) under 220V AC power source. The high voltage must not under any circumstance, exceed 30KV. It is recommended the reading of the high voltage be recorded as a part of the service record. It is important to use an accurate and reliable high voltage meter.
2- The primary source of X-RAY radiation in this TV receiver is the picture tube. For continued X-RAY radiation protection, the replacement tube must be exactly the same type tube as specified in the part list.

PT-11 CHASSIS ADJUSTMENT PROCEDURE

1- System Voltage (+B) Adjustment :

- Before switching on TV, all potentiometers should be adjusted at medium level. Then TV is switched on;
- Adjust all of the analog parameters to minimum with RC
- Adjust P1 trimpot until find +115 V on the cathode of D2 diode

2- AFT Adjustment:

- Place a balloon coil (300 Ohm dc resistance) parallel to L104
- Apply 80 dB uV 38.9 MHz (39.5 MHz for I) signal via balloon coil
- Connect a voltmeter to aft pin (pin 9) of IC301
- Adjust T101 coil until the voltage of this pin being 1.6 V dc

3- Adjustment of G2:

- Apply Philips Test pattern
- Adjust all of the analog parameters to minimum with RC
- Adjust G2 trimpot until seeing two bars on gray scale

4- Horizontal and Vertical Adjustment:

- Apply Philips Test pattern signal
- Center the picture horizontally while picture shifting to right and left with P101,
- Make vertical amplitude adjustment with P602 until seeing top and lower lines of picture will be seen
- Center the picture with P601

5- AGC Adjustment:

- Apply Philips Test Pattern whose amplitude is 60 dB uV to the RF input
- Adjust P102 until find a picture without snowy

6- Focus Adjustment:

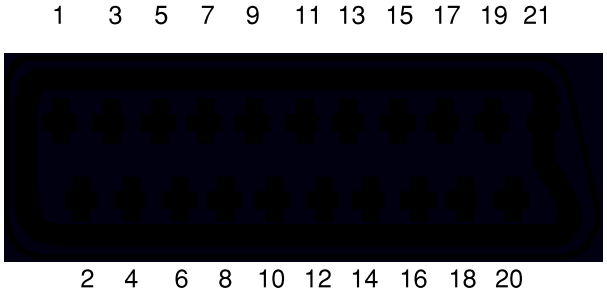
- Apply Cross-Hatch Pattern signal
- Find the optimum concentration point between H and V intersection in the middle of screen.

7- White Balance Adjustment :

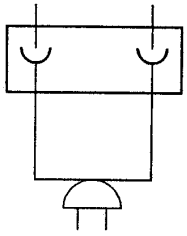
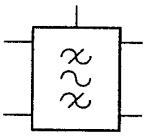
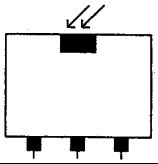
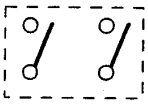
- Apply Philips Test Pattern signal
- Adjust all of the trimpots on CRT board to medium level
- Adjust color, contrast, brightness to minimum by RC
- Adjust G2
- Apply white pattern, settle in the probe of color analyzer to screen
- Increase brightness until geting Y=10 nits
- Adjust x=270 - 276 nits y=270 - 276 nits via “VR201, VR203, VR205”
- Increase brightness and contrast until Y=90 - 100 nits
- Adjust x, y to same values via “VR202 and VR204”
- Check white balance at high and low contrast level. Again make adjustment if it’s necessary.

SPECIFICATIONS OF THE CONNECTOR (EURO SCART)

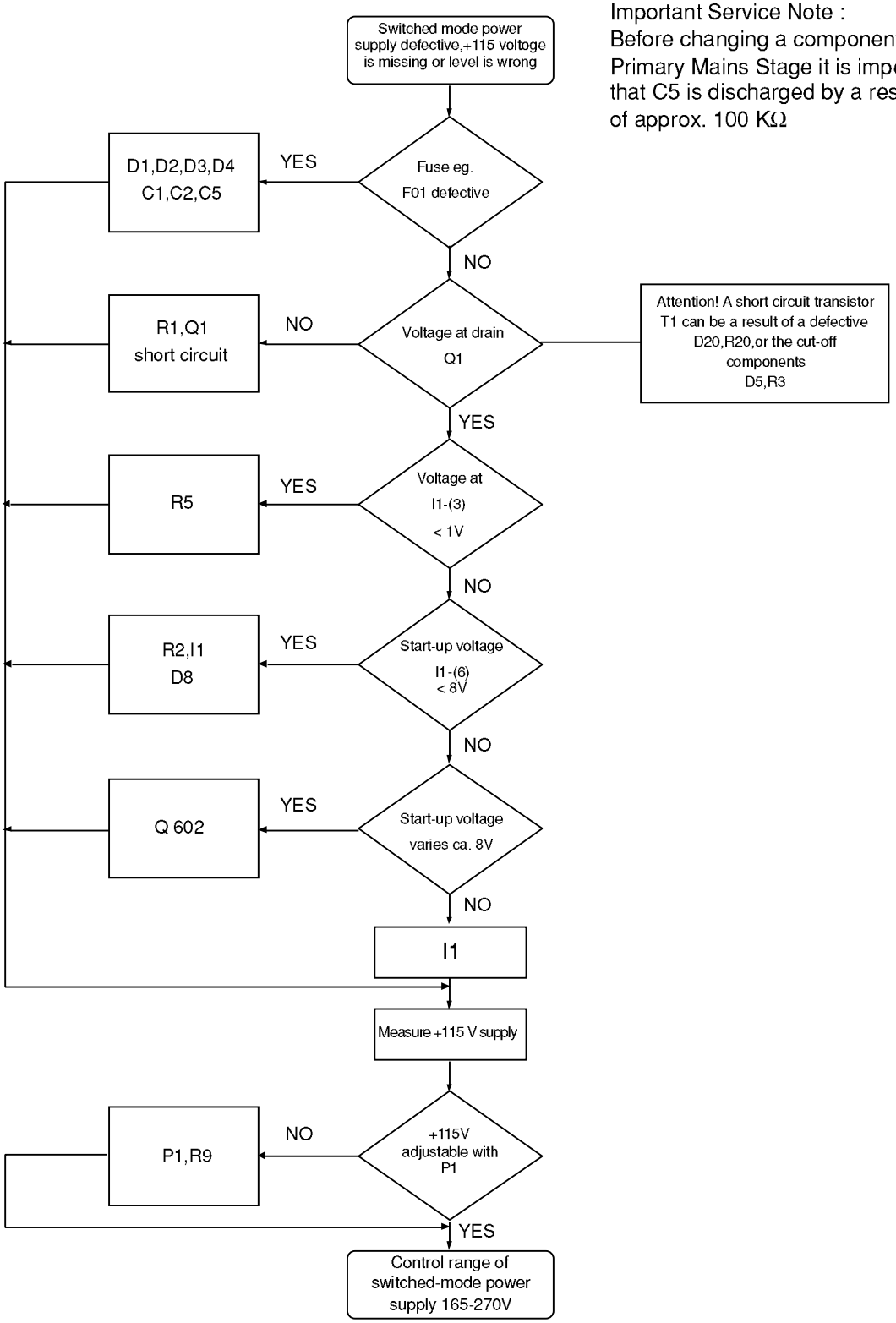
I- Audio output 1. right channel 0.5 VRMS
2- Audio input 1. right channel 0.5 VRMS
3- Audio output 2. left channel 0.5 VRMS
4- GND (audio)
5- GND
6- Audio input 2. left channel 0.5 VRMS
7- RGB input, blue (B)
8- Switch signal video (status)
9- GND
10- Reserved for clock signals (not connected)
11- RGB input, green (G)
12- Reserved for remote control (not connected)
13- GND
14- GND switch signal RGB
15- RGB input, red (R)
16- Switch signal RGB
17- GND (video)
18- GND19- Video output 1 Vpp/75 ohm
20- Video input 1 Vpp/75 ohm
21- Shield



COMPONENT DESCRIPTIONS

	POWER CORD
	SAW FILTER
	IR SENSOR
	VOLTAGE REGULATOR
	ON/OFF SWITCH
	LINE FILTER
	PTC
	NPN TRANSISTOR
	PNP TRANSISTOR
	CERAMIC FILTER
	COIL
	LINEARITY COIL
	FUSIBLE RESISTOR
	IW METAL OXIDE RESISTOR
	1/2W METAL OXIDE RESISTOR
	1/4 OR 1/6W CARBON FILM RESISTOR
	CERAMIC CAPACITOR /POLYESTER CAPACITOR
	ELECTROLITIC CAPACITOR
	DIODE
	ZENER DIODE
	SWITCH JUMPER
	NET (INPUT)
	NET (OUTPUT)
	TACT SWITCH

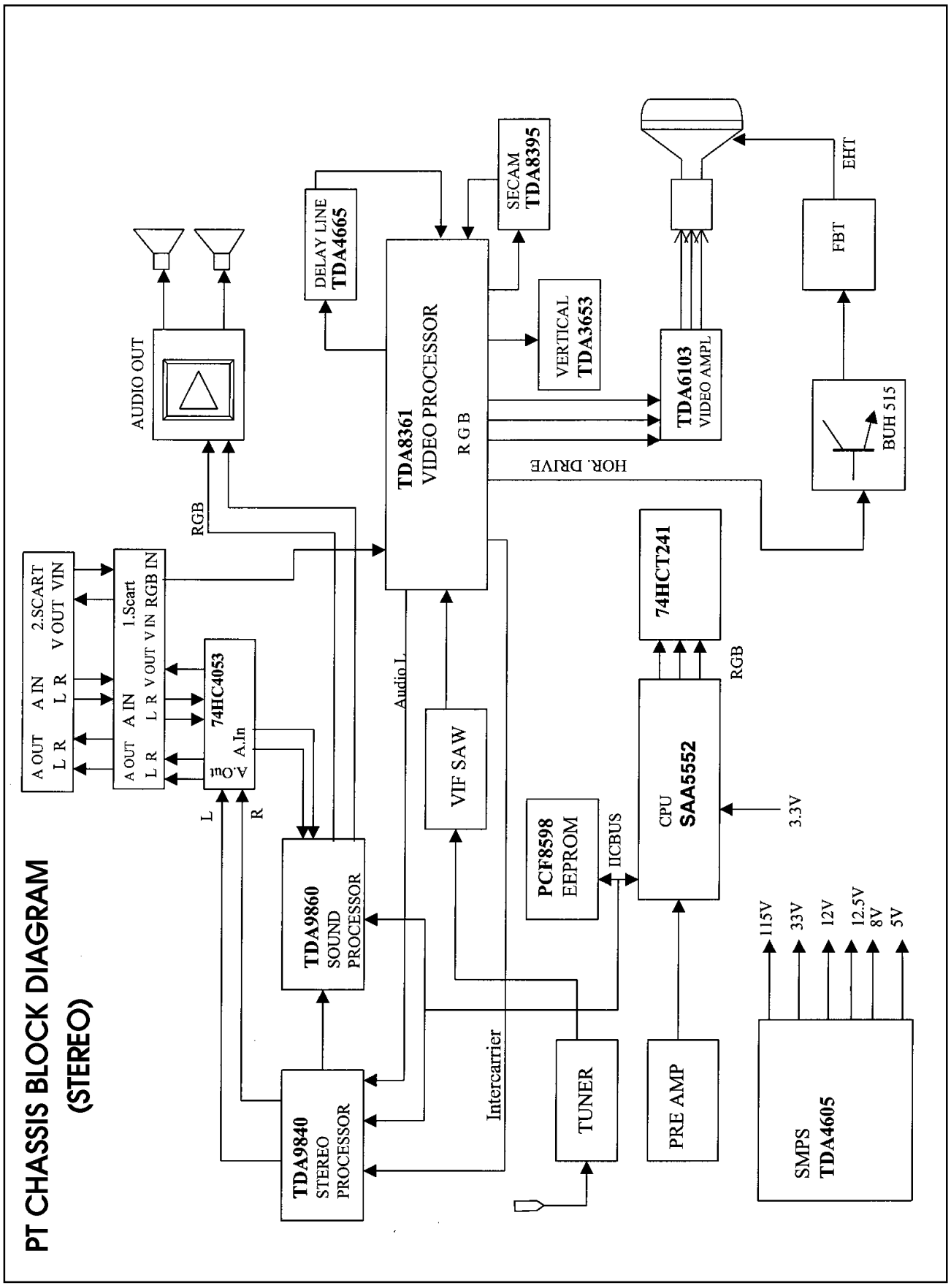
FAULT TRACING DIAGRAM-POWER SUPPLY

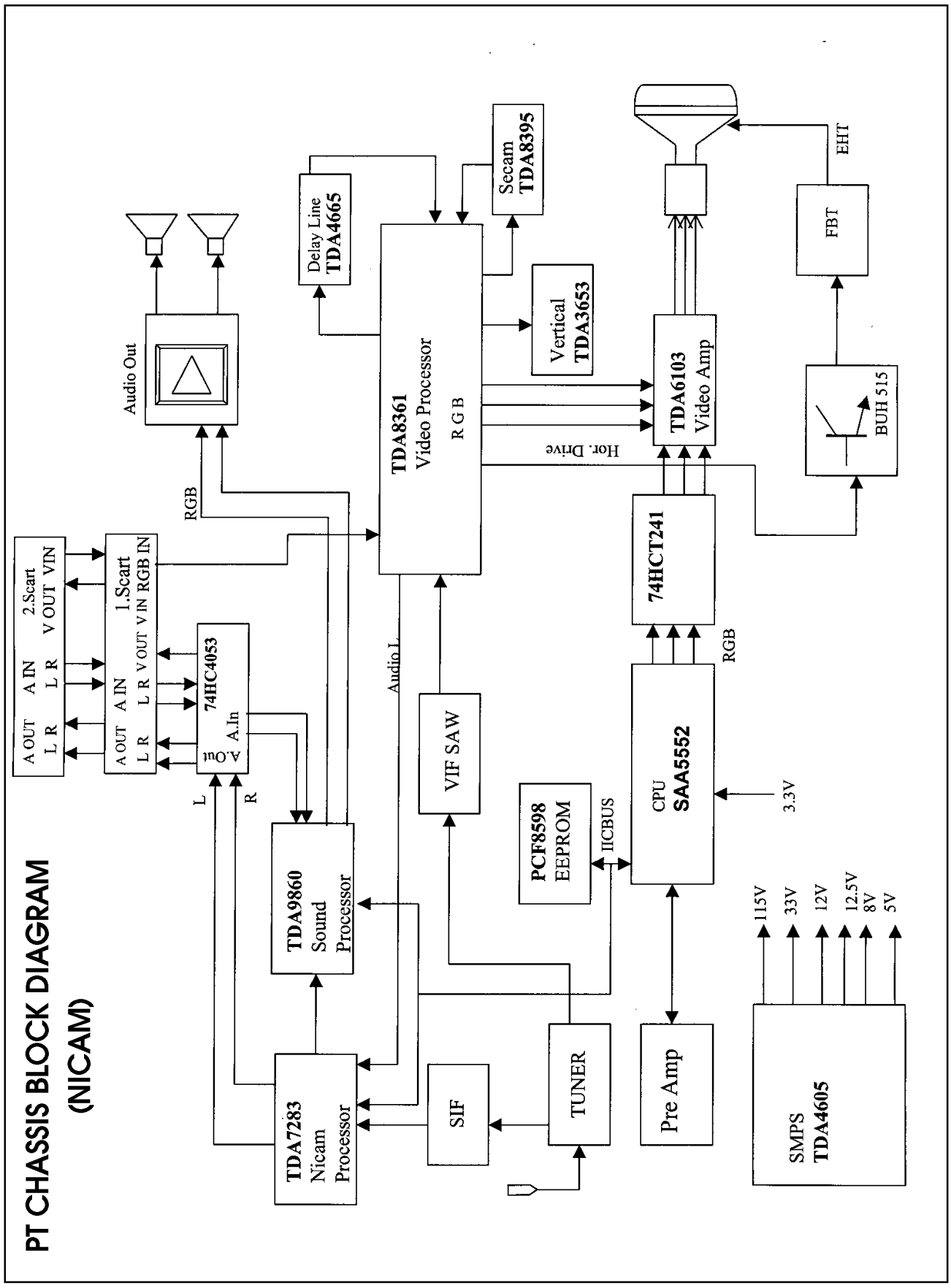


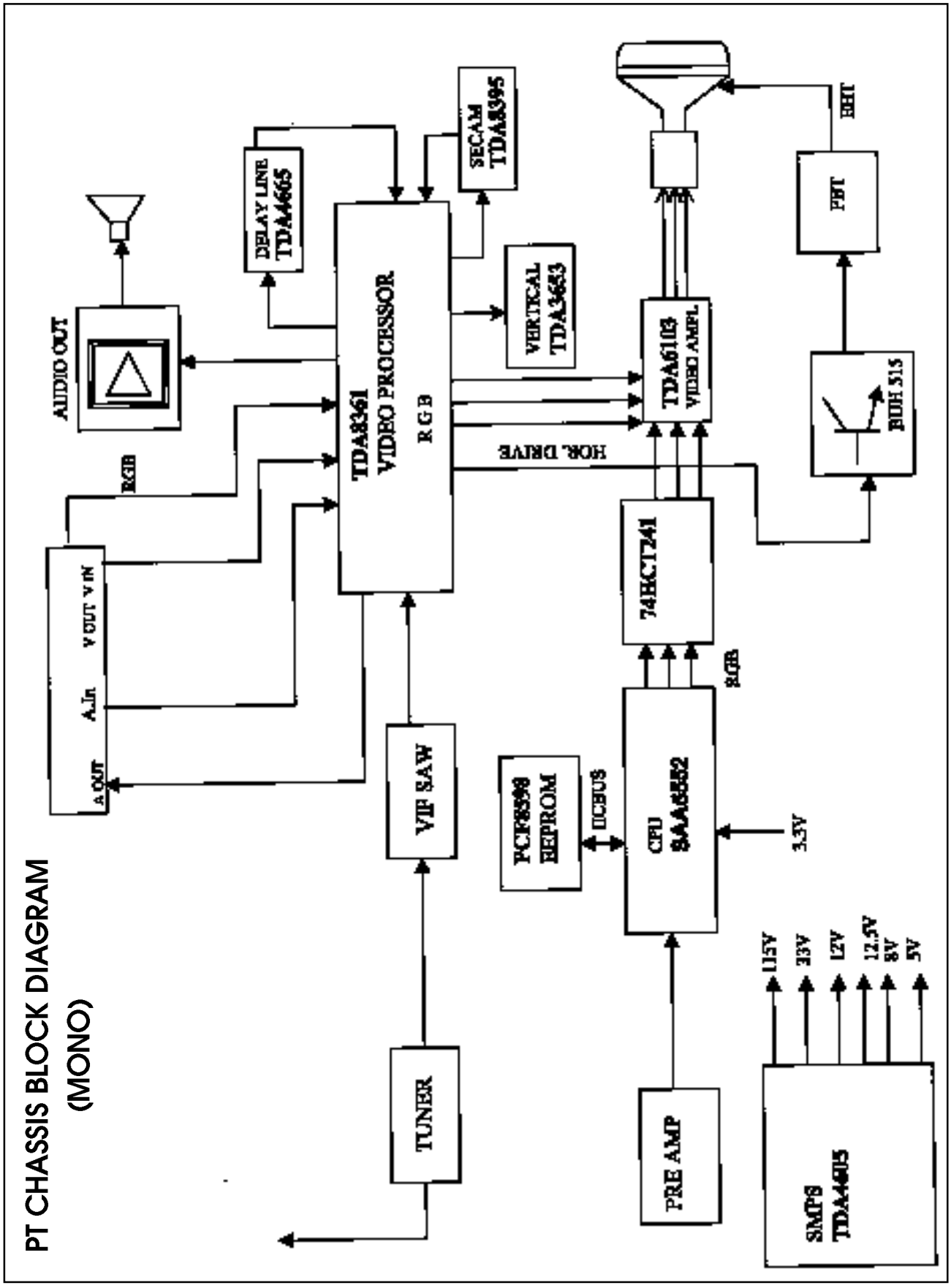
Important Service Note :
Before changing a component in the Primary Mains Stage it is imperative, that C5 is discharged by a resistor of approx. 100 KΩ

TROUBLESHOOTING GUIDE FOR MAIN PCB

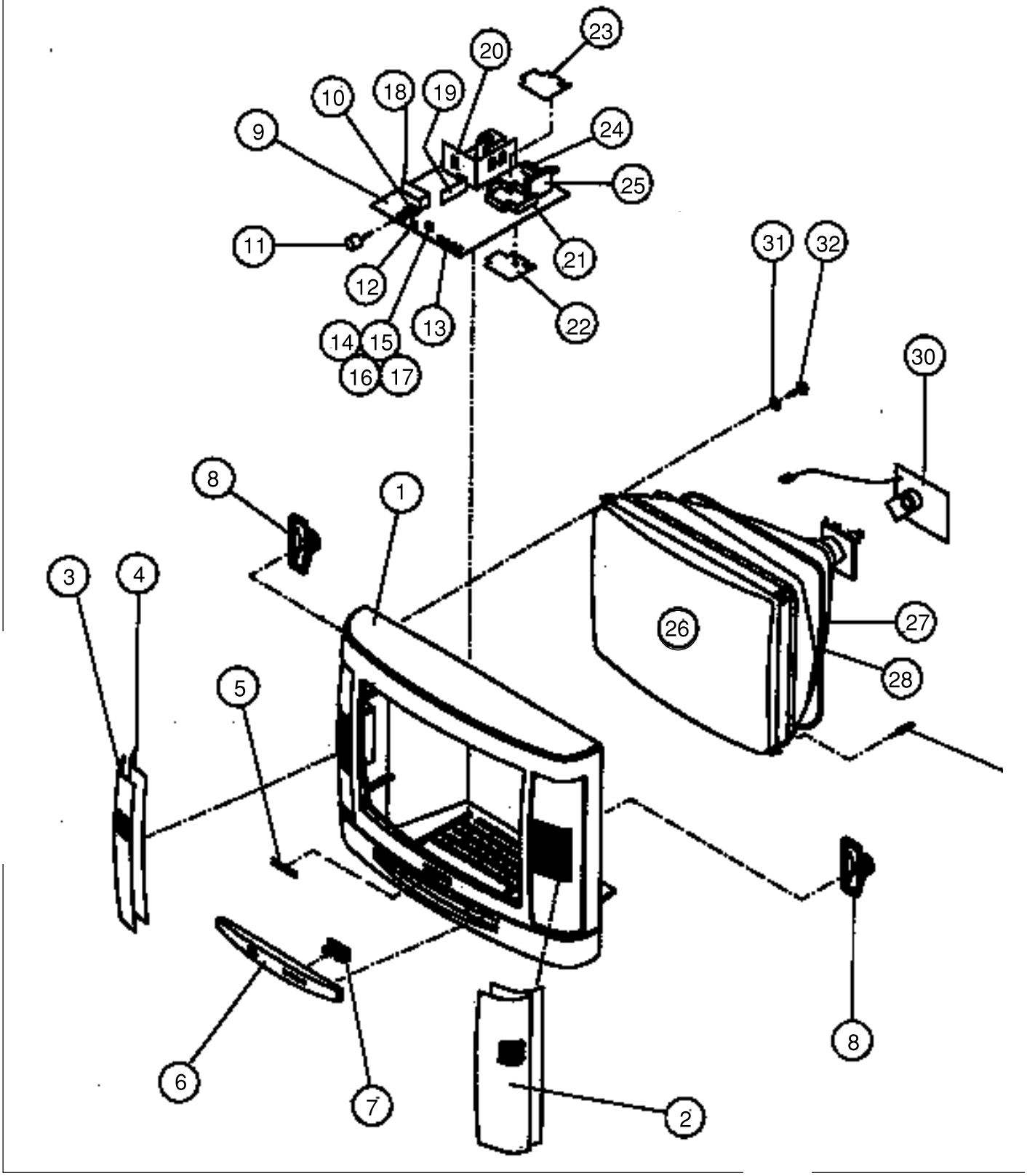
TROUBLE	CHECK POINTS
No color	I101, C127, I102, check pin 38-SSC
No vertical deflection	Check +K, I601, pin 42 I401, pin 43 I401
Vertical linearity	C 625, R 623
Vertical size	C 625, R 624
Vertical shift	R 626, P 601
Horizontal linearity	L 601, C 608
Horizontal size	+B, C 607, L 602
Flue picture	I101 pin 25, ABL, FOCUS, HEATER, EHT
Dark picture	I101 pin 17, SCREEN, EHT, +M
Noise picture	TU01, AGC, IF, FI101
Vert./horizontal synchrony	I101
Interference	TU01, IF, FI101
No sound	Check I101 pin 5 and pin 50, +G
Low sound	I101 pin 5, pin 50, I401 pin 5, +G, R 403
Sound distortion	+G, R 403
Contrast	I301 pin 5, I101 pin 25, ABL
Brightness	I301 pin 7, I101 pin 17
Color saturation	I301 pin 4, I101 pin 26
Tuning	I301 pin 1, Q 301, +D, TU01
Memory	I 302, I 301, SDA, SCL
Band select	I 301 pin +DPM 14,15 and 21, I 303, +K, TU01
No video-out on the SCART	Check TV-VID signals, Q 651
No video-in on the SCART	Check I301 pin 10, I101 pin 16 on AV mode, check the video signals on AV mode SCART pin 20 and I101 pin 15
No sound out on the SCART	I101 pin 1, Q 653 , Q654
No sound in on the SCART	Check the audio signals on SCART pin 2/6 and I101 pin 6
No remote control reception	Check signals on pin 3 IR01and I301 pin 35

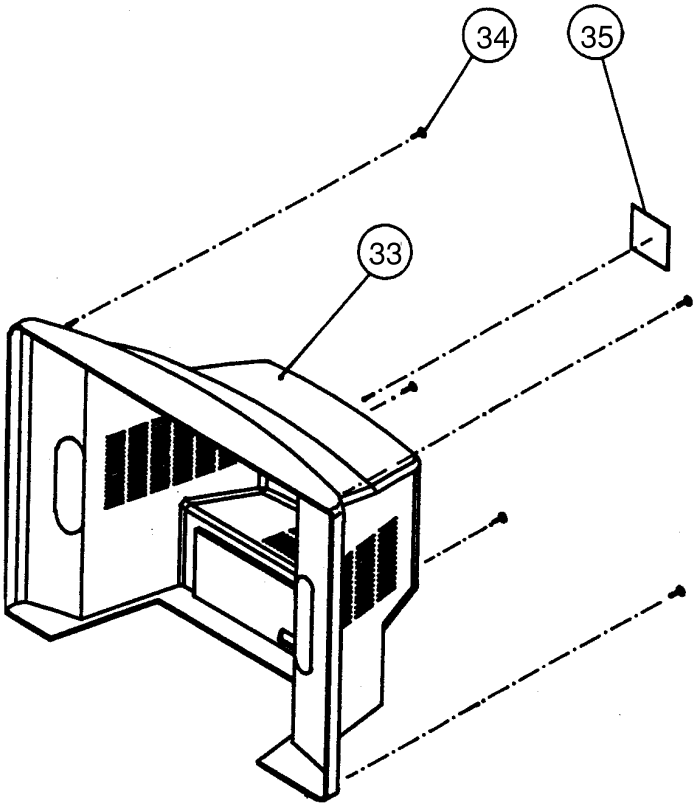

PT CHASSIS BLOCK DIAGRAM
(STEREO)
A OUT A IN 2.SCART
L R L R V OUT VIN
A OUT A IN 1.Scart
L R L R V OUT V IN RGB IN
74HC4053
A.Out
A.In
L
R
RGB
AUDIO OUT
TDA9840
STEREO
PROCESSOR
TDA9860
SOUND
PROCESSOR
TDA8361
VIDEO PROCESSOR
R G B
DELAY LINE
TDA4665
SECAM
TDA8395
VERTICAL
TDA3653
TDA6103
VIDEO AMPL
HOR. DRIVE
FBT
EHT
BUH 515
74HCT241
RGB
Audio L
VIF SAW
Intercarrier
TUNER
PRE AMP
PCF8598
EEPROM
IICBUS
CPU
SAA5552
3.3V
SMPS
TDA4605
115V
33V
12V
12.5V
8V
5V


PT CHASSIS BLOCK DIAGRAM
(NICAM)
Audio Out
RGB
2.Scart
A OUT A IN V OUT VIN
L R L R
1.Scart
A OUT A IN L R V OUT V IN RGB IN
L R L R
74HC4053
A.Out A.In
L
R
TDA7283
Nicam
Processor
TDA9860
Sound
Processor
Audio L
TDA8361
Video Processor
R G B
Hor. Drive
Delay Line
TDA4665
Secam
TDA8395
Vertical
TDA3653
VIF SAW
SIF
TUNER
PCF8598
EEPROM
IICBUS
CPU
SAA5552
3.3V
74HCT241
RGB
TDA6103
Video Amp
Pre Amp
FBT
EHT
BUH 515
SMPS
TDA4605
115V
33V
12V
12.5V
8V
5V


PT CHASSIS BLOCK DIAGRAM
(MONO)
AUDIO OUT
DELAY LINE
TDA4665
SECAM
TDA8395
TDA8361
VIDEO PROCESSOR
R G B
VERTICAL
TDA3653
TDA6103
VIDEO AMPL
FBT
EHT
RGB
HOR. DRIVE
BUH 515
74HCT7241
RGB
A OUT
A.In
V OUT V IN
VIF SAW
PCF8598
EEPROM
I2CBUS
CPU
SAA5852
3.3V
TUNER
PRE AMP
SMPS
TDA4605
115V
33V
12V
12.5V
8V
5V

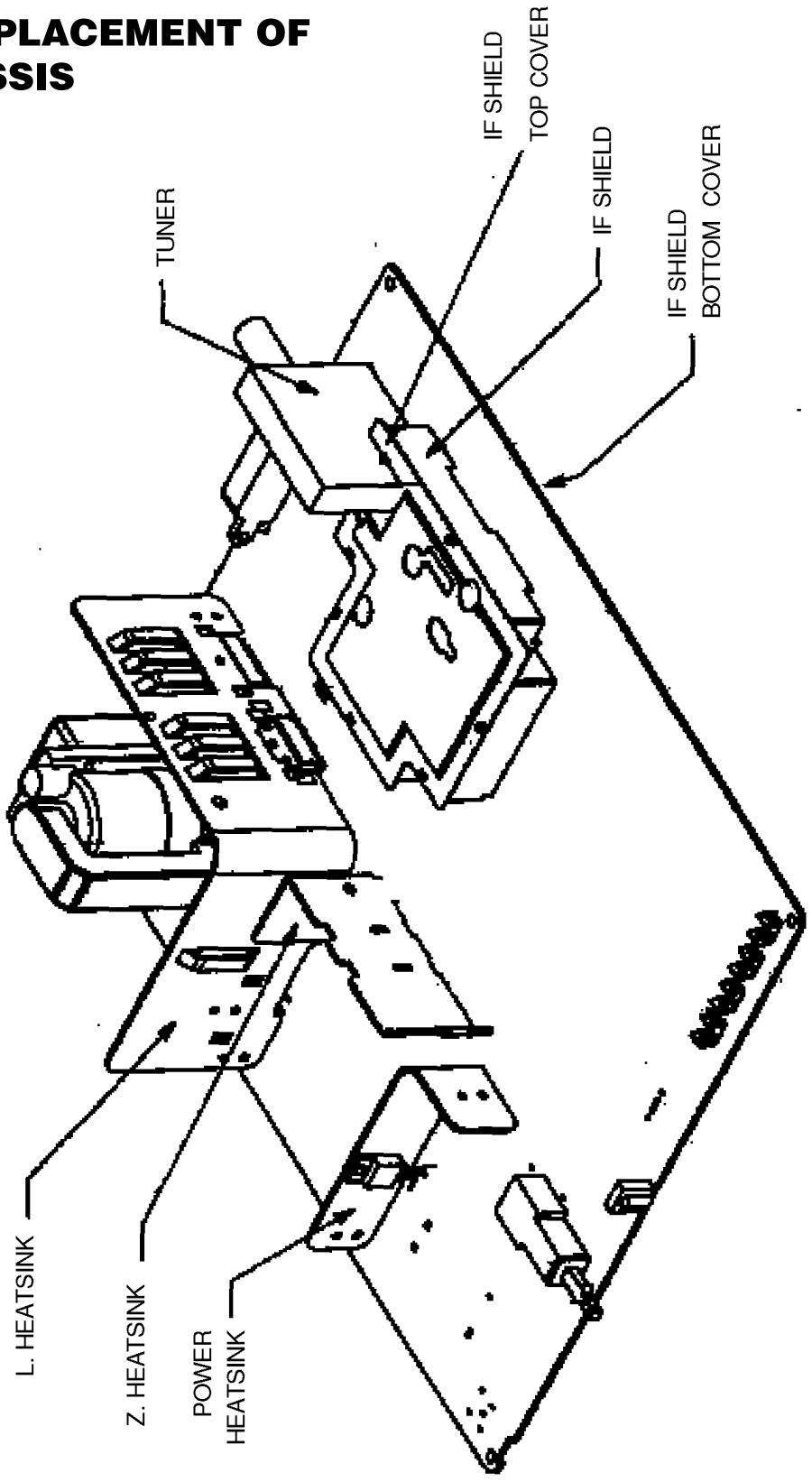
EXPLODED VIEW





01)	Front Cabinet
02)	Spk. Grill (Right)
03)	Spk. Grill (Left)
04)	Felt
05)	Logo
06)	Acrylic Window
07)	Multiple Button
08)	Speaker,
09)	Main Board
10)	Power Switch
11)	ON/OFF Button
12)	Preamplifier
13)	Tact Switch
14)	Led PCB Holder,
15)	Led PCB
16)	Led Holder
17)	Led
18)	Heatsink Blk. PT2
19)	Heatsink Blk. PT3
20)	Heatsink Blk. PTI
21)	IF Shield
22)	IF Bottom Cover
23)	IF Top Cover
24)	Scart Socket
25)	Tuner
26)	Picture Tube
27)	Degaussing Coil
28)	Mass Wire
29)	Spring
30)	CRT PCB Bik.
31)	Washer
32)	CRT Screw 5x3O
33)	Back Cover
34)	Screw 3.9xl9
35)	Back Cover Label

THE PLACEMENT OF CHASSIS



DESCRIPTONS OF THE PARTS

1- SWITCH MODE POWER SUPPLY STAGE

In order to supply the DC voltage required at various parts of the chassis, a SMPS transformer controlled by the IC TDA 4605 and switching transistor 3N90 is used. CI, EM1, C2 filter circuit prevents the network noises and the effects of high frequency which produced in TV set. After rectifying DC voltage is filtered by using C5. The stat up voltage of TDA4605 is obtained from R2 at the same time a square wave ii produced from pin 5 of IC TDA4605. This square wave reaches QI passing through R8. After that Q1 form and induction on TR1, which produces a voltage on pin 6. This voltage rectified by D6 is used as a supply voltage of IC 1. IC 1 does not operates SMPS by stopping pulses at pin 5, when the network is higher or lower than fixed limits. Pin 2 is control pin of overload. This stage produces 115V for FBT, 12V for audio part, 33 V for tuning circuit 5V, 12V (tuner and some ICs) and 8V (for TDA8362) are produce by the means of the regulators LM7805, LM317 and LM7808. This circuit operates between 165 VAC and 250VAC (5OHz).

2- MICROCONTROLLER STAGE

Below items are controlled or generated by means of these controllers.

- SAA5552 is used as controller on PT-11 Painter chassis.
- Voltage synthesis tuning
- On screen display
- Control the transmission standard
- Fastext decoder
- Full peri-TV (scart) switching and double scart switching on stereo models,
- Controls of stereo decoder TDA 9840 as German Stereo Decoder
- Sound processing (Bass, treble, balance)
- Controls of the analog values of the picture (Brightness, Color, Contrast)

3- ANALOG OPERATION PART WITH TDA 8362

TDA8362 is a single-chip TV processor which contains nearly all small signal functions that are required for color television receiver. Fora complete receiver the following circuits need to be added a base-band delay line (TDA4665) a tuner and output stages for audio, video and horizontal and vertical deflection. TDA8362 can handle signals with positive modulation and it supplies the signals which are required for secam decoder TDA8395.

VIDEO IF AMPLIFIER

The IF amplifier contains 3 AC-coupled control stages with a total gain control range of greater than 60 dB.The reference carrier for the video demodulator is obtained by means of passive regeneration of the picture carrier. The external reference tuned circuit is the only remaining adjustment of the IC.

In the TDA8362 the polarity of the demodulator can be switched so that the circuit is suitable for both positive and negative modulated signals. The AFC circuit is driven with the same reference signal as the video demodulator. To ensure that the video content does not disturb the AFC operation a sample and hold circuit incorporated; the capacitor for this function is internal. the AFC output voltages 6V. The AGC detector operates on levels, top sync for negative modulated and top white for positive modulated signals . The AGC detector time constant capacitor is connected externally.

SYNCHRONIZATION CIRCUIT

The sync separator is preceded by a voltage controlled amplifier which adjusts the sync pulse amplitude to a fix level. The sync pulses are then fed to the slicing stage (separator) which operates at 50 % of the amplitude.

The separated sync pulses are fed to the first phase detector and to the coincidence detector. The coincidence detector is used for transmitter identification and to detect whether the line oscillator is synchronized. When the circuit is not synchronized, the voltage on the peaking control pin (pin 14) is LOW so that this condition can be detected externally

The IC TDA8362 contains a start up circuit for the horizontal oscillator. When this feature is required a current of 6.5 mA has to be supplied to pin 36.

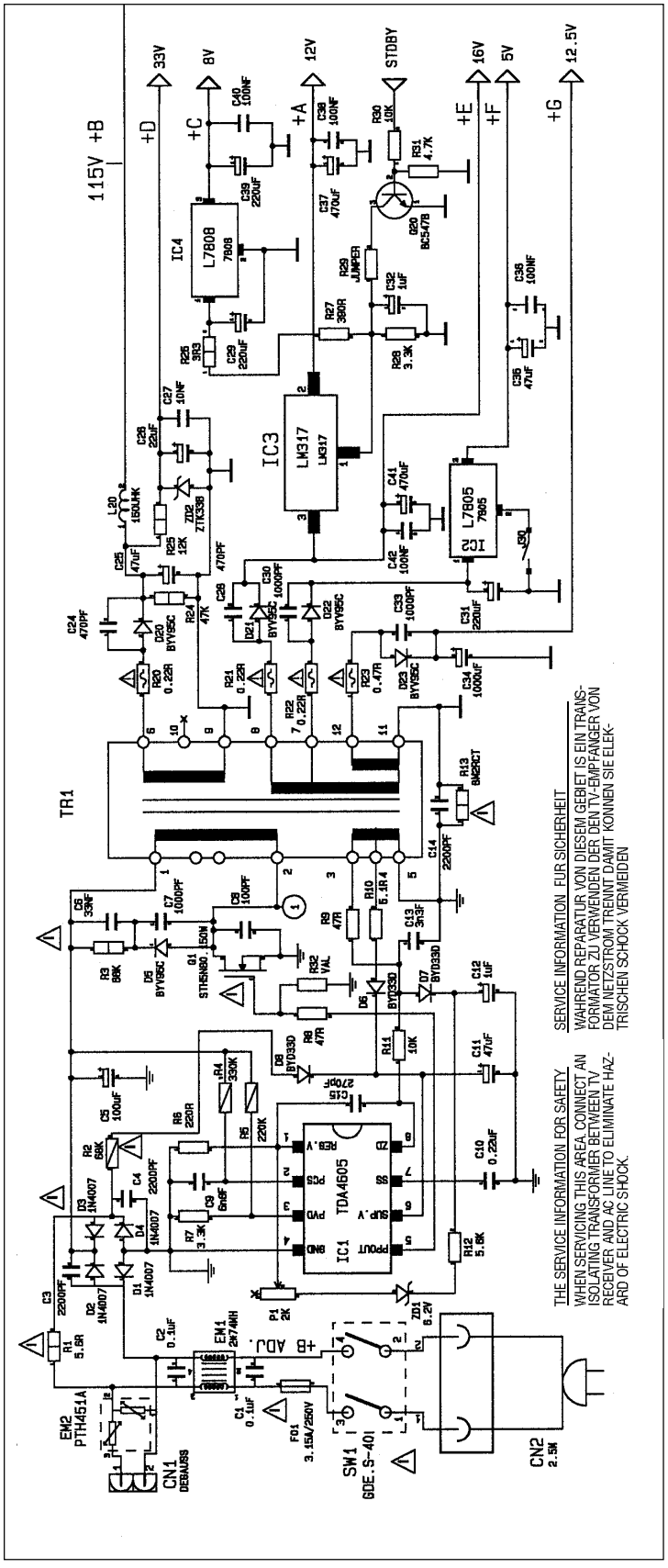
COLOR DECODING

TDA8362 contains PAL and NTSC decoder (TDA8361 contains only PAL decoder) but it can cooperate with the secam add-on secam decoder TDA8395. The communication between two IC's is achieved via pin 32. The TDA8362 supplies the reference signal (4.43 MHz) for the calibration system of the TDA8395, identification of the color standard is via the same connection. When a SECAM signal is detected by the TDA8395 the IC will draw a current of 150 uA. When TDA8362 has not identified a color signal in this condition it will go into the SECAM mode, that means it will switch of the

R-Y and B-Y outputs and increase voltage level on pin 32.

4- VERTICAL DEFLECTION CIRCUIT WITH TDA3653B

The TDA3653B is vertical deflection circuit for drive of various deflection systems with currents up to 1.5 A peak to peak. Pin 5 is the output pin. the supply for the output stage is fed to pin 6 and the output stage ground is connected to pin 4. Pin 1 is the input for the driver of the output stage . The signal at pin 1 is also applied via external resistors to pin 3 which is the input of the switching circuit. When the flyback starts, this switching circuit rapidly turns off the lower output stage and so limits the turn-off dissipation. It should be noted that the lowest voltage at pin 8 is > 2.5 V, during normal operation.



SMPS STAGE CIRCUIT DIAGRAM

5- HORIZONTAL DRIVE CIRCUIT

The horizontal drive pulses obtained from pin 37 of the TDA8362 are connected to base of Q601(2SC1573) via R602. Q601 drives Q602 (BUH515D) via the drive transformer TR602. TR601 is the EHT transformer. + B (115 V) is switched by Q602 and TR601 generates both “EHT, FOCUS, G2 voltages required for CPT” and “170 V, Heater voltage and 26 V vertical supply voltage”. The anode beam current information from pin 7 of TR601 is used for reducing contrast at too high beam currents, in order to stabilize the voltages derived from power supply.

6- SOUND OUTPUT STAGE

On mono models, TDA7056A is used as sound output amplifier with DC volume control. Pin 50 of the TDA8362 is AC coupled to the input pin 3 of the TDA7056A via a RC filter. It is supplied by + 12V coming from a separate winding in the SMPS transformer.

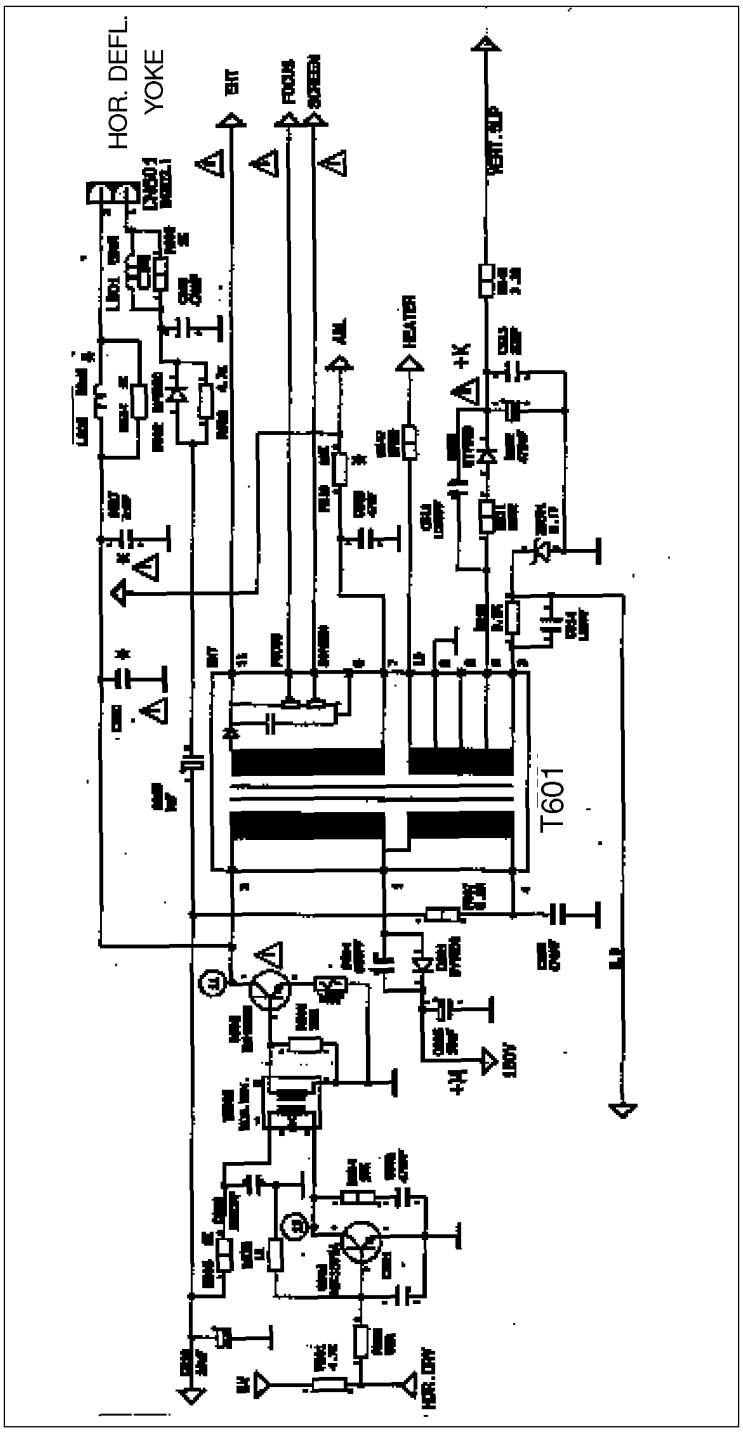
On stereo models, TDA7057AQ is used as sound amplifier. The sound level is controlled by sound processor TDA8425 via I^2C bus on stereo boards. The outputs of TDA8425 (pin 9 and pin 13) is connected to TDA705-7AQ via a divider circuit and two capacitors.

7- CRT STAGE

The TDA6103Q is used on CRT stage as video output amplifier. The TDA6103Q consists of three monolithic video output amplifiers. Each amplifier can be seen as an operational amplifier with negative feedback. The advantage of negative feedback is that the amplifier characteristics do not play an important role up to certain frequencies.

The device needs only one power supply voltage (+M). In contrast to previous types of DMOS video amplifiers, the TDA 6103Q does not need a second supply voltage (12V.), so it saves one wire from motherboard to CRT stage.

As the TDA 8362 has no white point adjustment and no black current set-up, two adjustments are required for gain and three adjustments for black setting.



HORIZONTAL DRIVE PART CIRCUIT DIAGRAM

THE DETAILS OF THE BOARDS

Mother Board Contains

- TDA8362 Multistandard TV processor
- SAA5552 Micro Processor
- TDA4605 Switch Mode Power Supply Controller
- TDA4665 Baseband Delay Line
- TDA8395 Secam Decoder
- TDA7057AQ Audio Output Amplifier
- PCF 8598 Memo
- TDA3653B Vertical Driver
- LM317 Voltage Regulator
  LM7805 Voltage Regulator

- Tuner
- Infrared Receiver
- Horizontal Deflection Part
- Degaussing Circuit
- 4 push buttons (p+, p-, v+, v-)
- Stand By Led
- Main Switch
- Scart Jack
- Extension Connectors

CRT Board

- TDA6103Q Video Output Amplifier

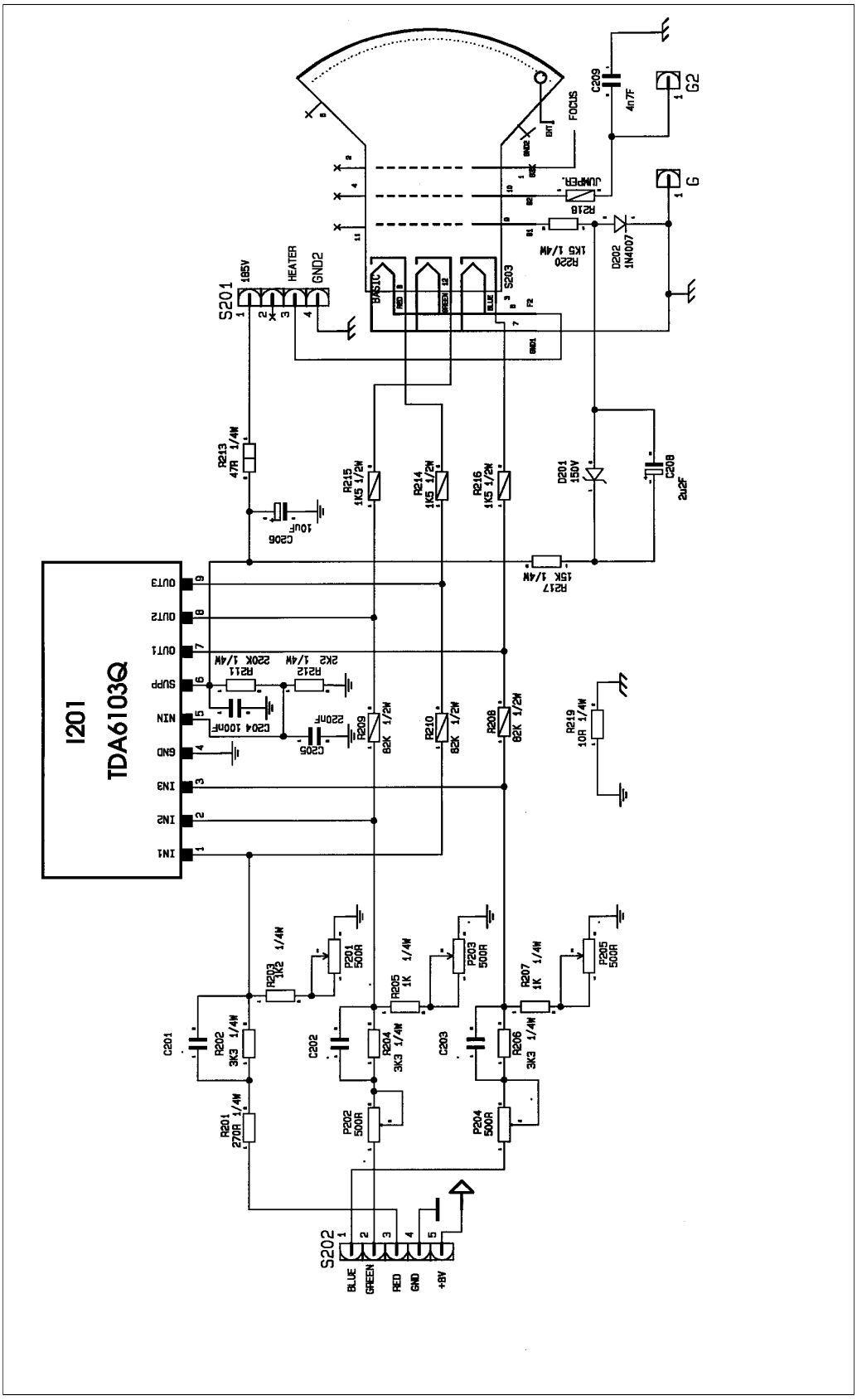
Extension Boards

German Stereo Board

- TDA9840 Stereo Processor
- TBA120U SIF
- TDA9860 Sound Processor

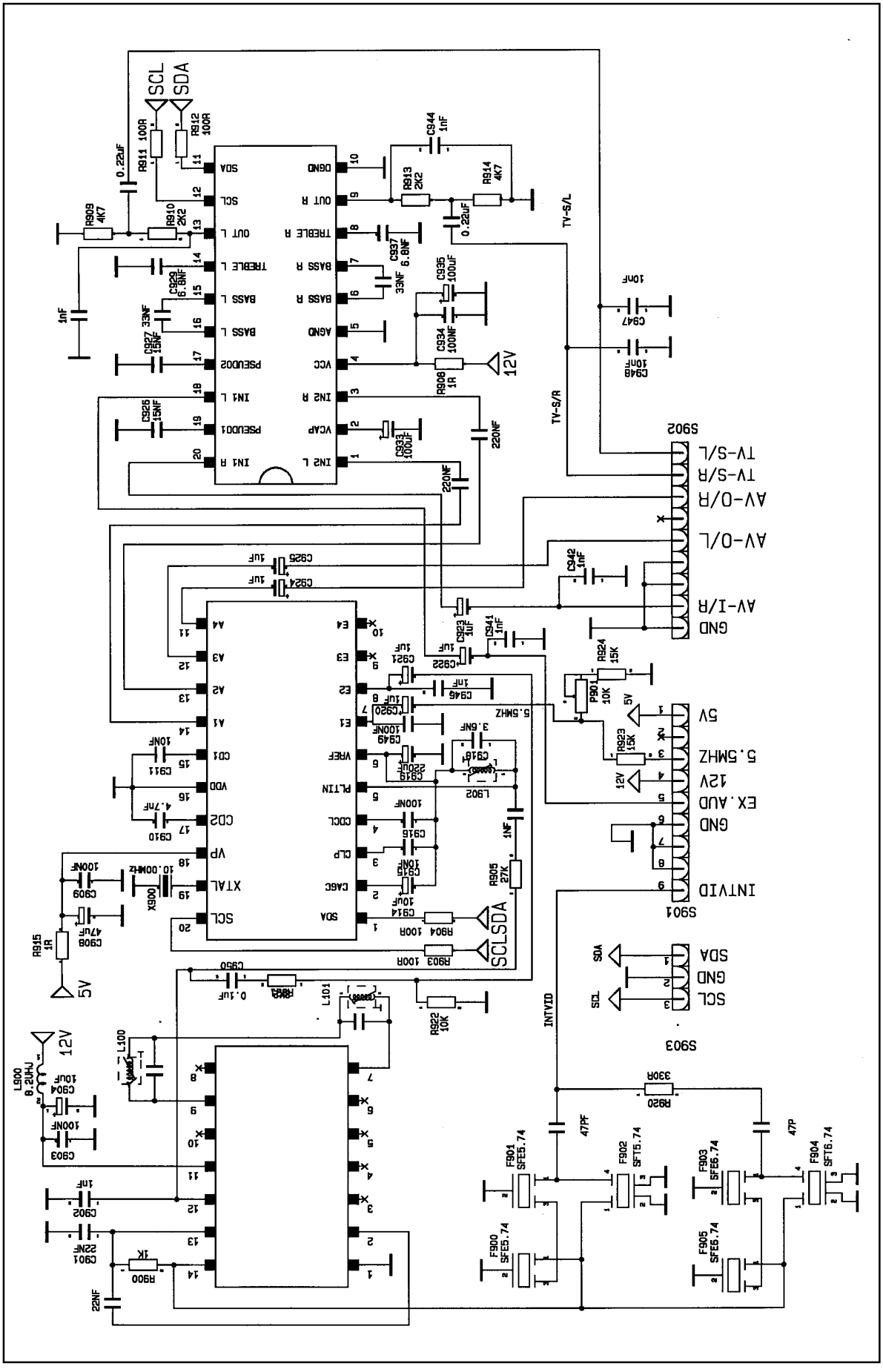
Double Scart Board

- 74HC4053 DEMUX

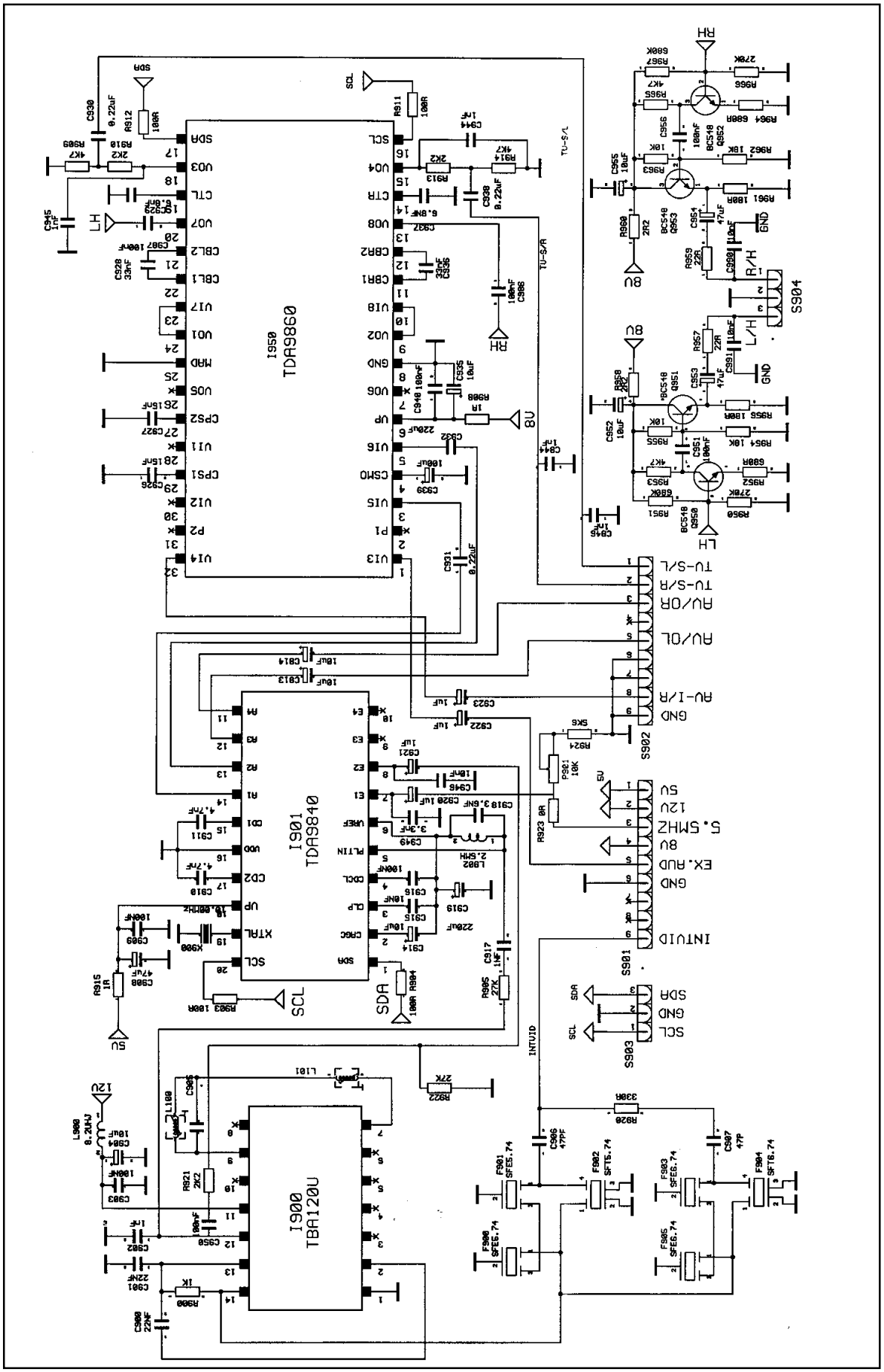


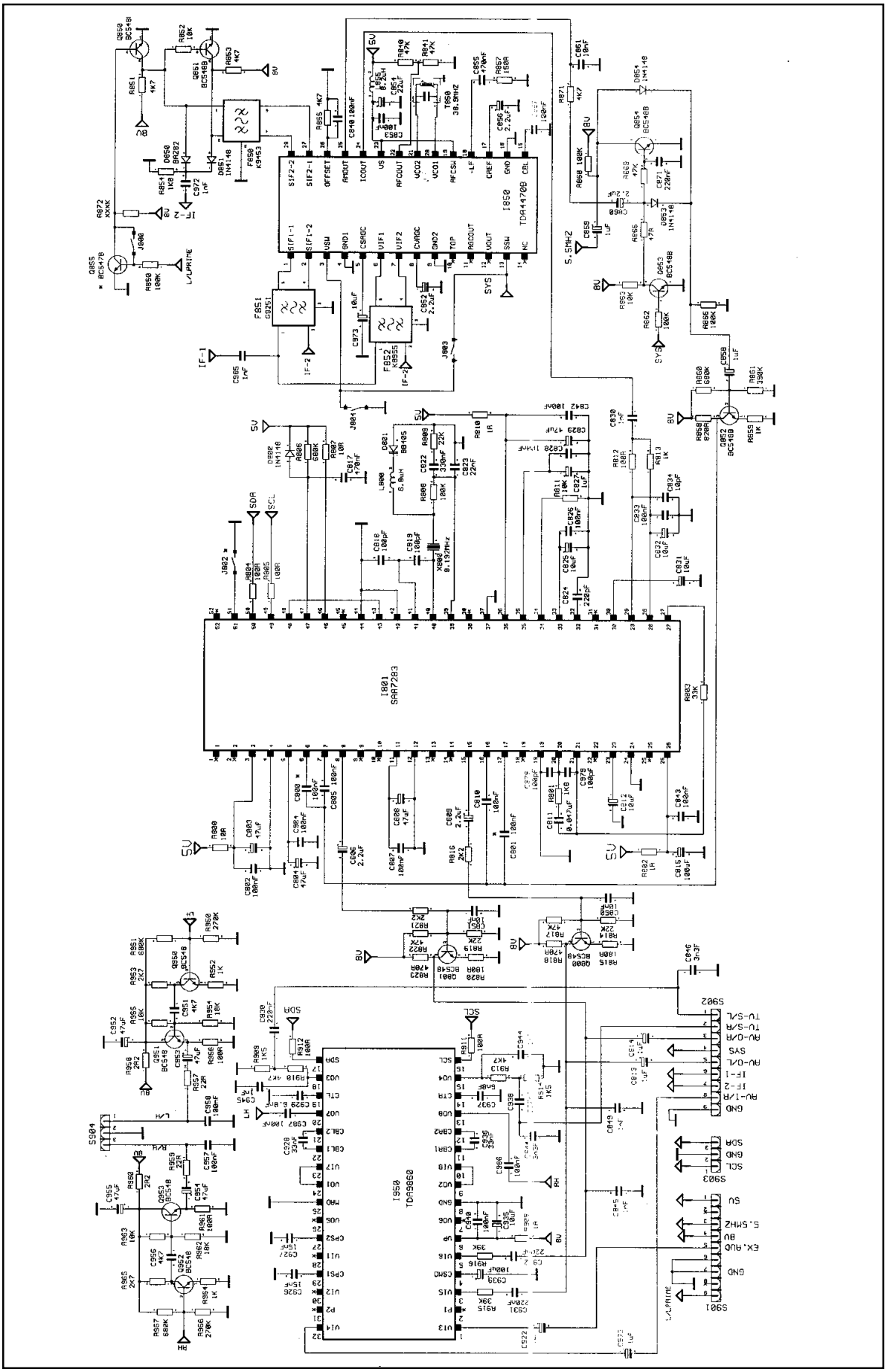
CRT BOARD CIRCUIT DIAGRAM

GERMAN STEREO BOARD CIRCUIT DIAGRAM



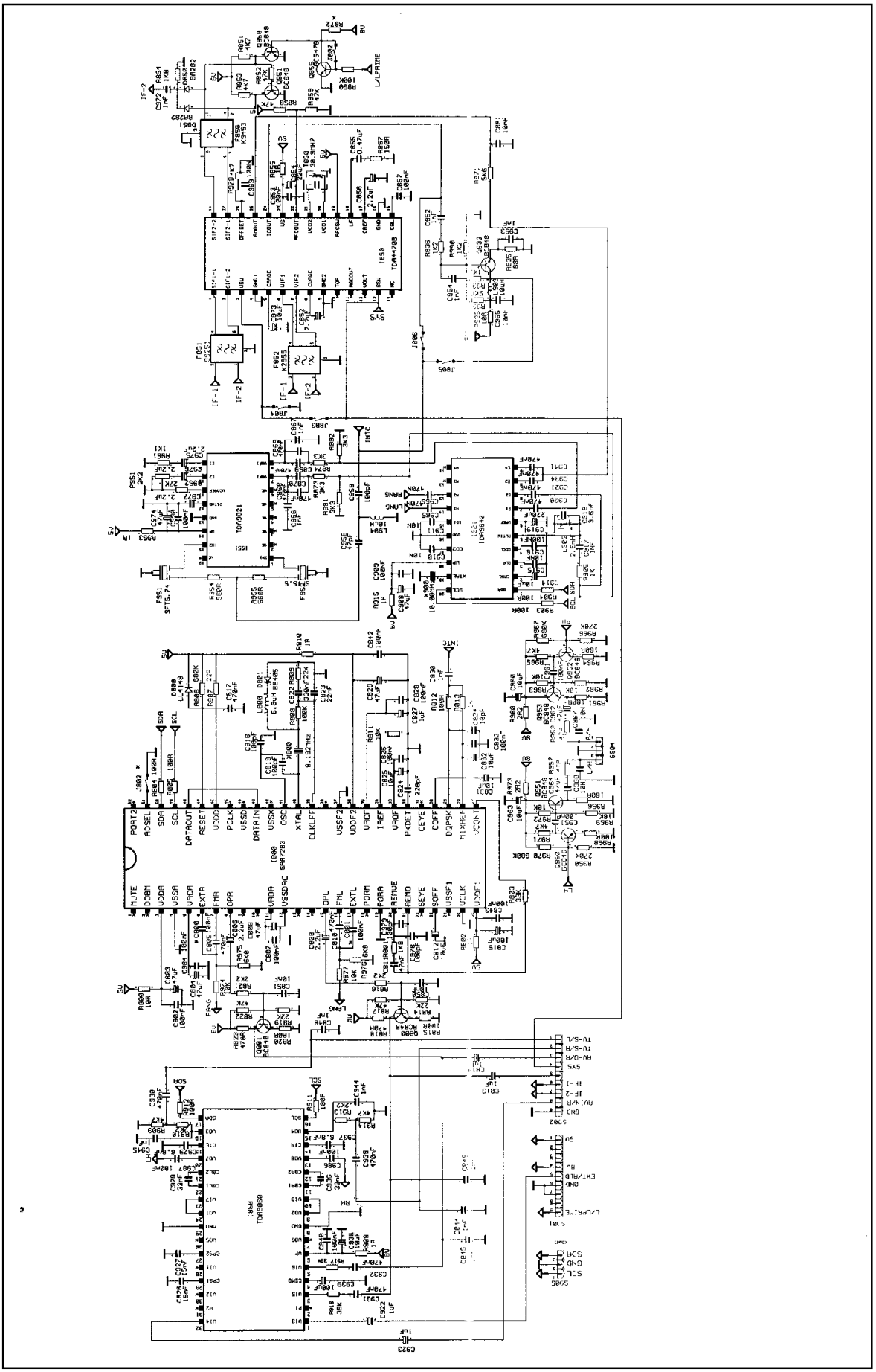
GERMAN STEREO



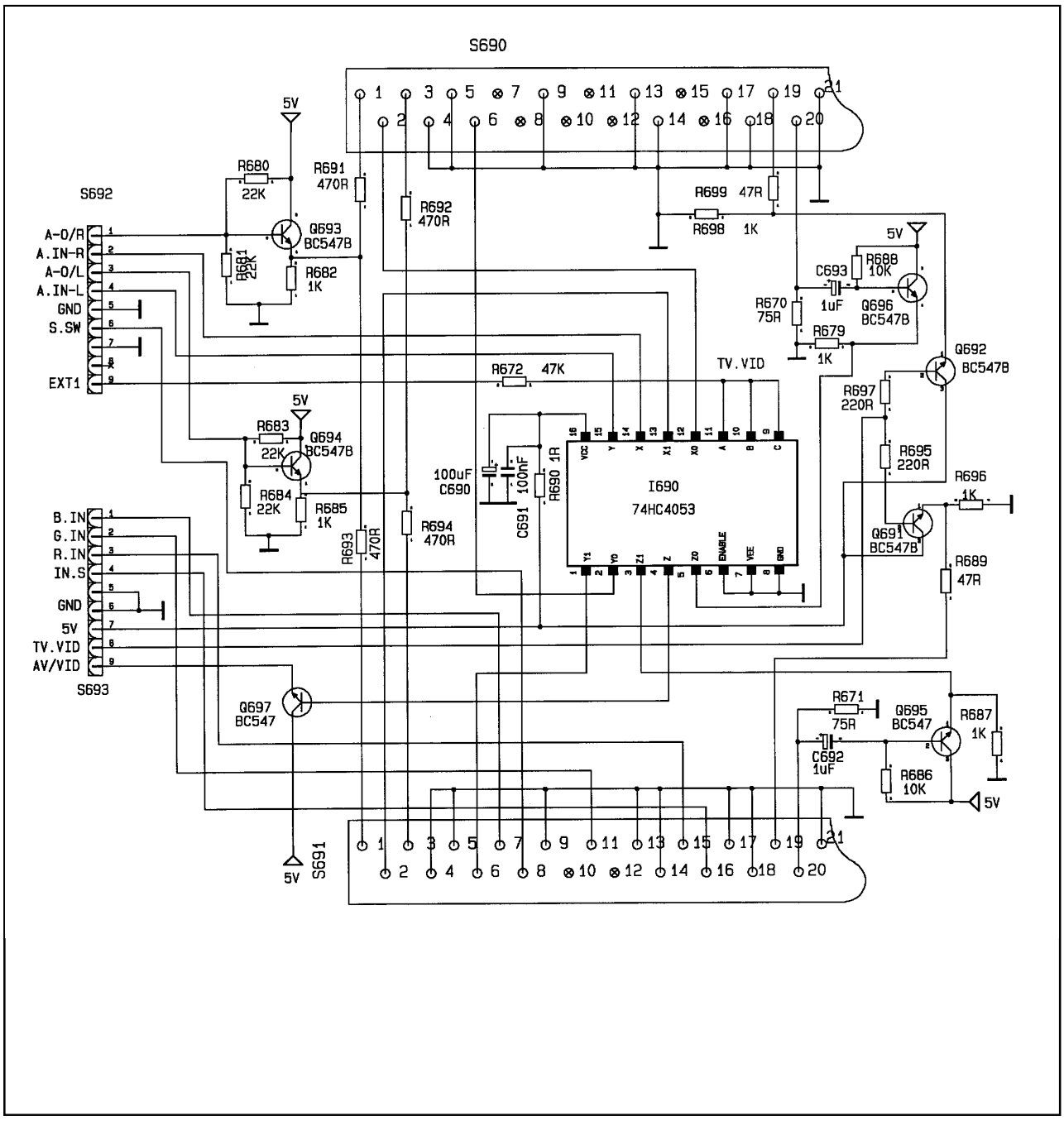


NICAM

NICAM L



DOUBLE SCART BOARD CIRCUIT DIAGRAM



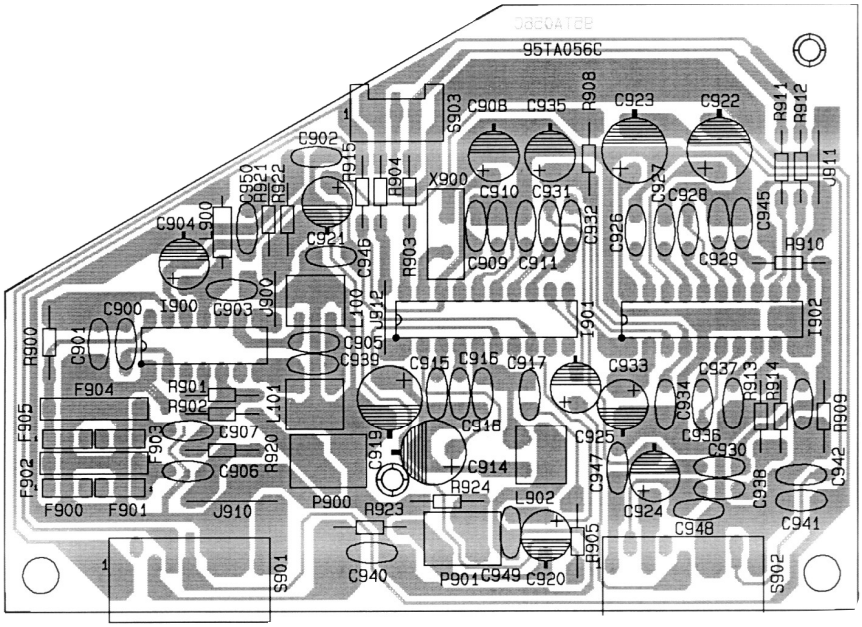
MAIN CHARACTERISTICS

▶ Tube	: 90° narrow neckCPT
▶ Chassis	: Push through chassis for keyboard
▶ Color And Sound System	: European Standards B, G, SECAM Decoding
▶ Power Source	: AC 175V - 250V
▶ Power Consumption	: 70W
▶ Stand-By Power Consumption	: 12 W
▶ Channel Coverage	: VHF (2-4, 5-12) UHF (21-69) CATV (S1-S41)
▶ Number of Programs	: 99
▶ Audio Outputs	: 2*4 Watts
▶ Speakers	: 2*8 Ohm
▶ Antenna Input	: 75 Ohm IEC

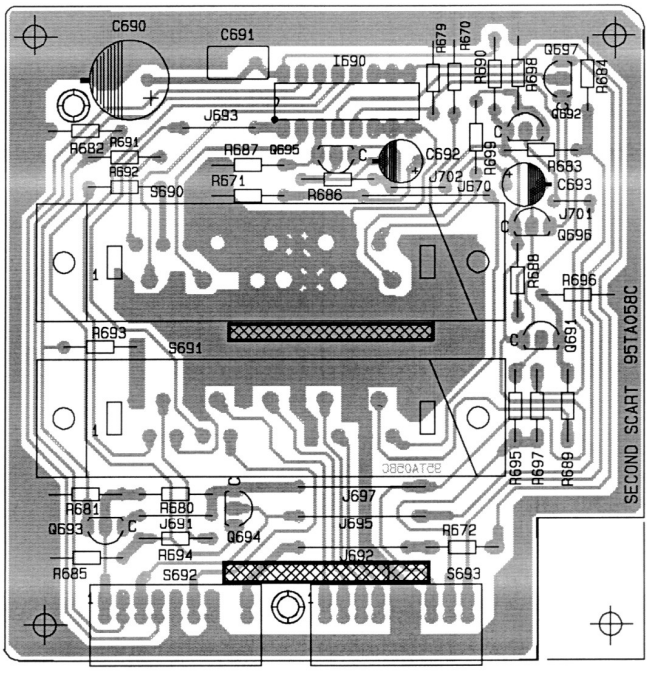
Standard Features

- ATS Europlus
- Auto search
- Personal Preference
- Auto Shut-off
- Scart with RGB
- Swap function
- Store function on RC
- On - Screen Display
- Fine tunning
- Prog ±, Vol ± control buttons on the set
- Sleep timer
- RC Hand Unit: TM45L type
- Program Naming

THE BOARD LAYOUTS



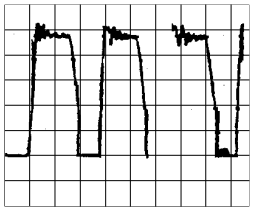
GERMAN STEREO BOARD



DOUBLE SCART BOARD

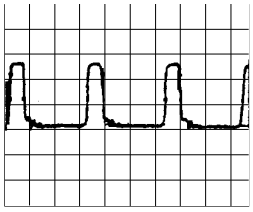
OSCILLOSCOPE SHAPES

1) 5usn/div 100 volt/div



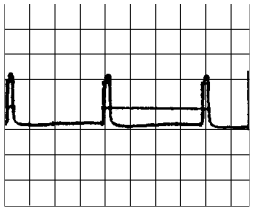
Drain of Q1

2) 20 usn/div 2 volt/div



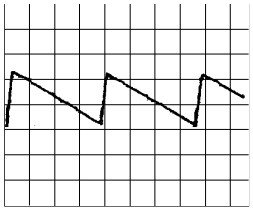
I 301 pin 26

3) 5 msn/div 2 volt/div



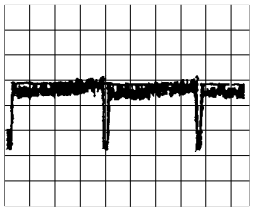
I 301 pin 27

4) 5 msn/div 0.5 volt/div



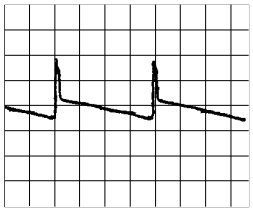
I 101 pin 41

5) 5msn/div 1 volt/div



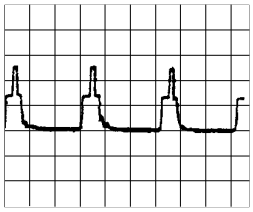
I 601 pin 3

6) 5usn/div 20 volt/div



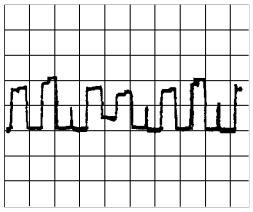
I 601 pin 5

7) 20usn/div 2 volt/div



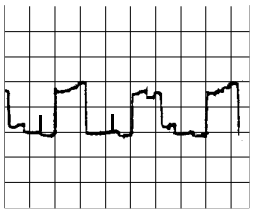
I 101 pin 38

8) 20usn/div 2 volt/div



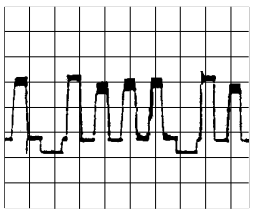
I 101 pin 20

9) 5usn/div 2 volt/div



I 101 pin 19

10) 10 usn/div 2 volt/div

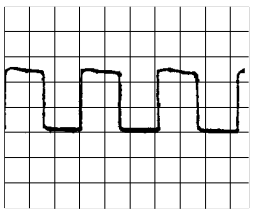


I 101 pin 18

11) 10 usn/div 250 volt/div

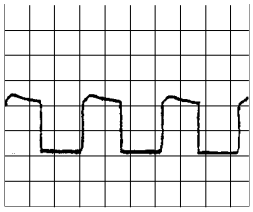
Collector of Q602

12) 20 usn/div 0.2 volt/div



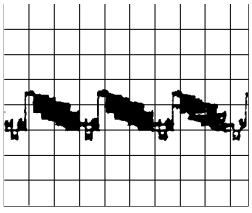
I 101 pin 37

13) 20usn/div 50 volt/div



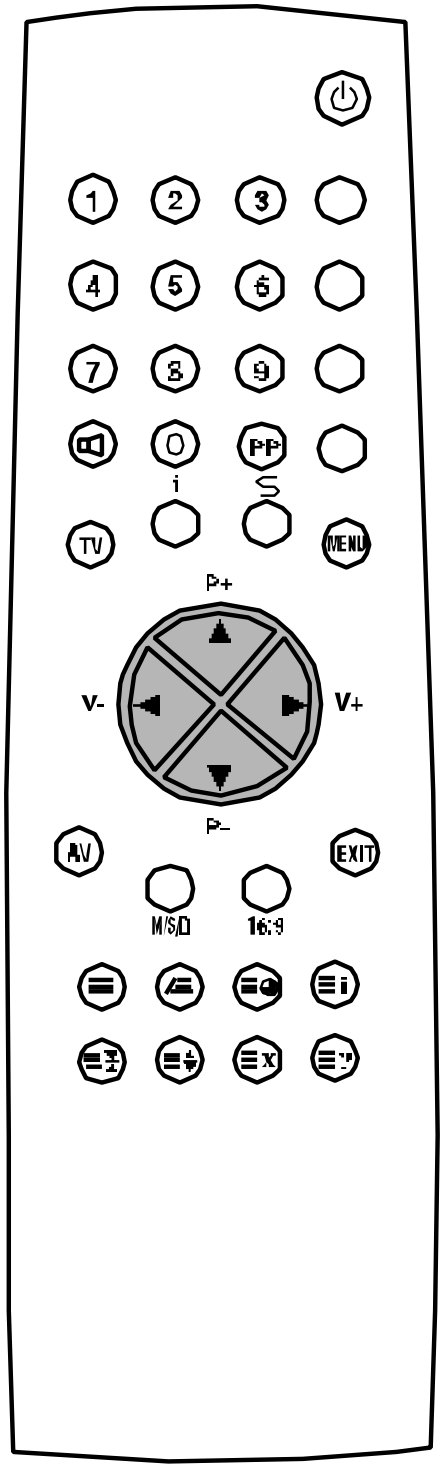
Collector of Q601

14) 20usn/div 1 volt/div

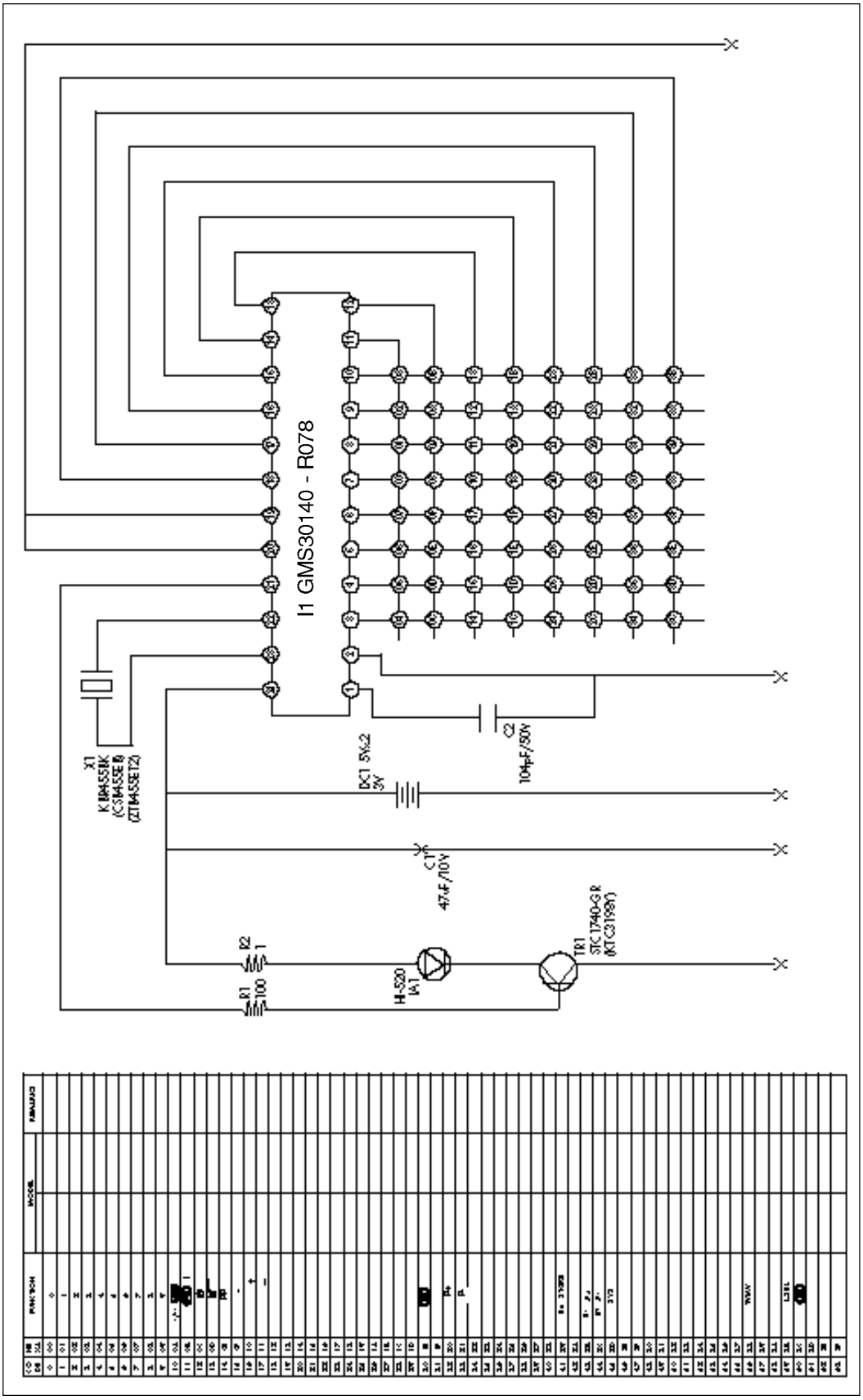


I 101 pin 13

RC HAND UNIT AND CIRCUIT DIAGRAM



REMOTE CONTROLLER TRANSMITTER PCB CIRCUIT DIAGRAM



THE DESCRIPTION OF THE INTEGRATED CIRCUITS

TDA8362

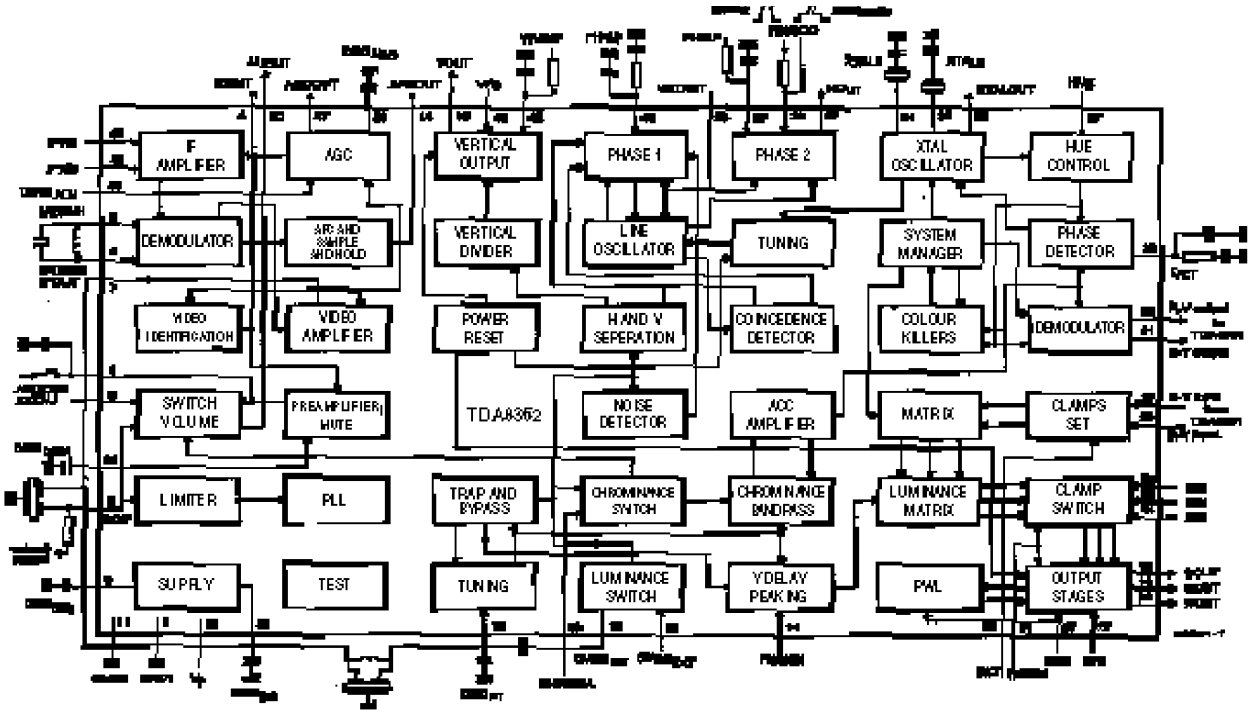
Video Processing Unit

Video and time base is based on the TDA 8362 Multistandard TV Processor(Pal Decoder),TDA 4665 Base-band Delay Line and TDA8395 Secam Decoder.

The Features of this Concept:

- Multistandard vision IF circuit (positive and negative modulation)
- Multistandard FM sound demodulator (4.5 MHz to 6.5 MHz)
- External Video and Audio Switches
- Integrated chrominance traps and baseband filters
- Integrated luminance delay line
- RGB control circuit with linear RGB inputs
- Horizontal synchronization with two loops and alignment-free horizontal oscillator without external components.
- Vertical count-down circuit (50-60 Hz) and vertical preamplifier
- Low dissipation
- Only one adjustment (vision IF demodulator)

Block Diagram



PINNING

PIN		PIN VOLTAGE
1	Audio deemphasis and +/- mod.switch	: 3V and 0.3Vrms(FM Audio)
2	IF-demodulator tuned circuit	: 6V
3	IF-demodulator tuned circuit	: 6V
4	Video identification output	: 5V
5	Sound IF plus volume control	: 0.5V - 4V
6	External audio input	: 4V
7	IF video output	: 2.5V and 2.0 Vpp (Video)
8	Decoupling digital supply	: 8V
9	Ground	: -
10	Positive supply (8V)	: 8V
11	Ground	: -
12	Decoupling filter tuning	: 3.25V
13	Internal CVBS input	: 4.25V
14	Peaking input	: 4V
15	External CVBS input	: 3.5V
16	Chroma + A/V switch input	: 0V(TV)-8V (AV)
17	Brightness control input	: 1V - 3.5V
18	B-output	: 2.5V - 4Vpp
19	G-output	: 2.5V - 4Vpp
20	R-output	: 2.5V - 4Vpp
21	RGB-insertion and blanking	: 0V TV and 1.5V RGB mode
22	R-input for insertion	: 3.3V and 0.7 Vpp
23	G-input for insertion	: 3.3V and 0.7 Vpp
24	B-input for insertion	: 3.3V and 0.7 Vpp
25	Contrast control input	: 0V - 3V
26	Saturation control input	: 0V - 3V
27	Hue control input (or chroma out)	: 6V
28	B-Y input signal	: 4V
29	R-Y input signal	: 4V
30	R-Y output signal	: 1.5V
31	B-Y output signal	: 1.5V
32	4.43MHz output for TDA8395	:1.6V(PAL) 4.5V(SEC)
33	Loop filter burst phase detector	: 4.5V
34	3.58 MHz X-tal connection	: 3V
35	4.43MHz X-tal connection	: 2V
36	Start horizontal oscillator	: 8V

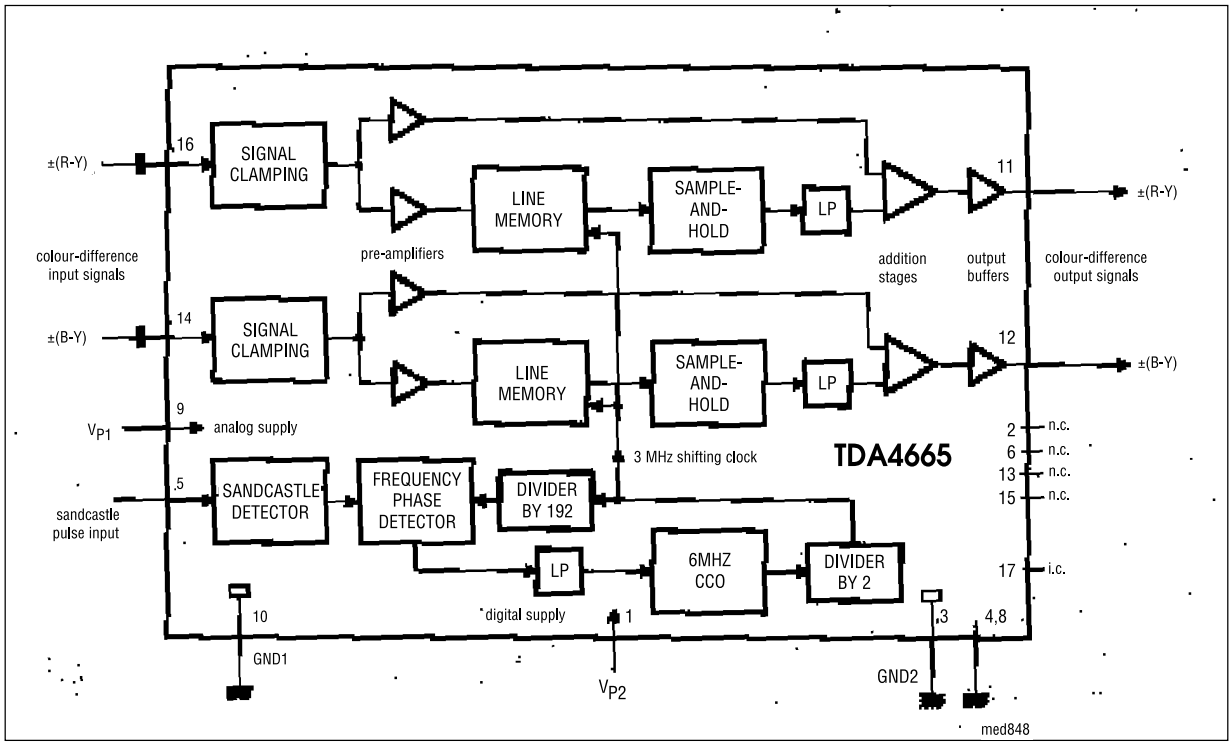
PIN		PIN VOLTAGE
37	Horizontal output	: 0.6Vp-p 15.6 KHz
38	Flyback input / sandcastle output	: 6Vpp
39	G2 loop filter	: 3V
40	G1 loop filter	: 3.75V
41	Vertical feedback input	: 2.5V and 1.0Vpp
42	Vertical ramp generator	: 2.5V and 1.5Vpp
43	Vertical output	: 2.5V
44	AFC output	:
45	IF-input	: 4V
46	IF-input	: 4V
47	Tuner AGC output	: -
48	AGC decoupling capacitor	: 4V
49	Tuner take-over adjustment	: -
50	Audio output	: 3.4V
51	Decoupling sound demodulator	: 4.5V
52	Decoupling bandgap supply	: 6.5V

TDA 4665

The TDA4665 is an integrated baseband delay line circuit. It provides a delay of 64 us for the color differen-ce signals. (R-Y) and (B-Y), in multi-standard TVs.

PINNING		PIN VOLTAGE
1	Digital supply voltage	: 5V
2	Not connected	: -
3	Digital ground	: 0V
4	Test input	: 0V
5	Sandcastle input	: -
6	Not connected	: -
7	Test input	: -
8	Test input	: -
9	Analog supply voltage	: 5V
10	Analog ground	: -
11	-(R-Y) output	:3.25V
12	-(B-Y) output	:3.25V
13	Reference current	: -
14	-(B-Y) input	:1.35V
15	Not connected	: -
16	-(R-Y) input	:1.35V

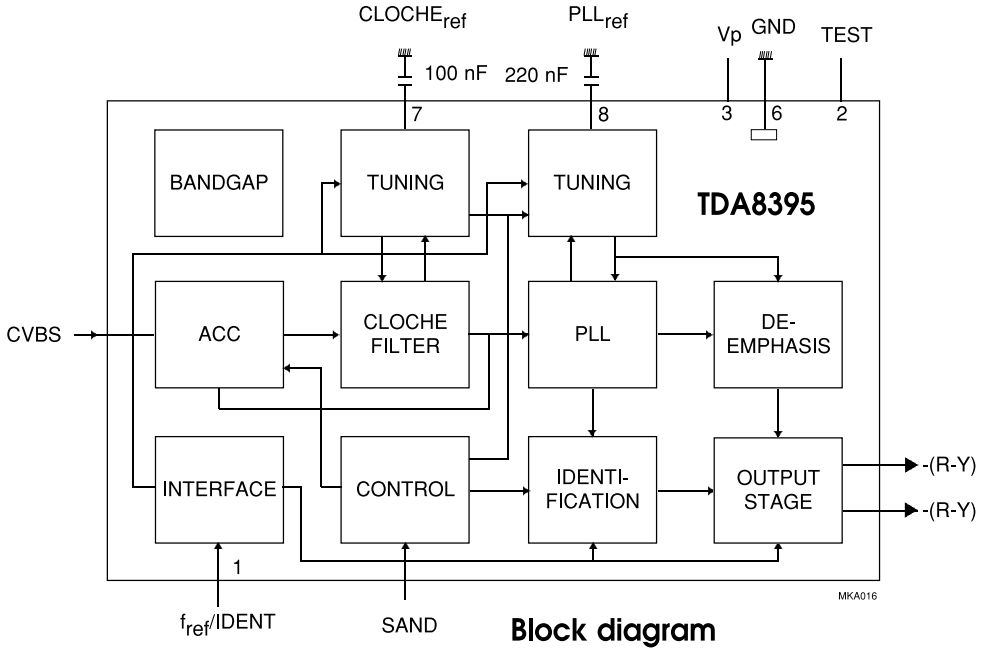
Block diagram



TDA 8395

The TDA8395 is a self calibrating fully integrated SECAM decoder.

PINNING		PIN VOLTAGE
1	Reference frequency input	: -
2	Test output	: -
3	Positive supply voltage	: 8V
4	Not connected	: -
5	Not connected	: -
6	Ground	: 0V
7	Cloche reference filter	: -
8	PLL reference	: -
9	-(R-Y) output	: 1V
10	-(B-Y) output	: 1.3V
11	Not connected	-
12	Not connected	: -
13	Not connected	: -
14	Not connected	: -
15	Sandcastle pulse input	: 6Vpp
16	Video input	: -



Block diagram

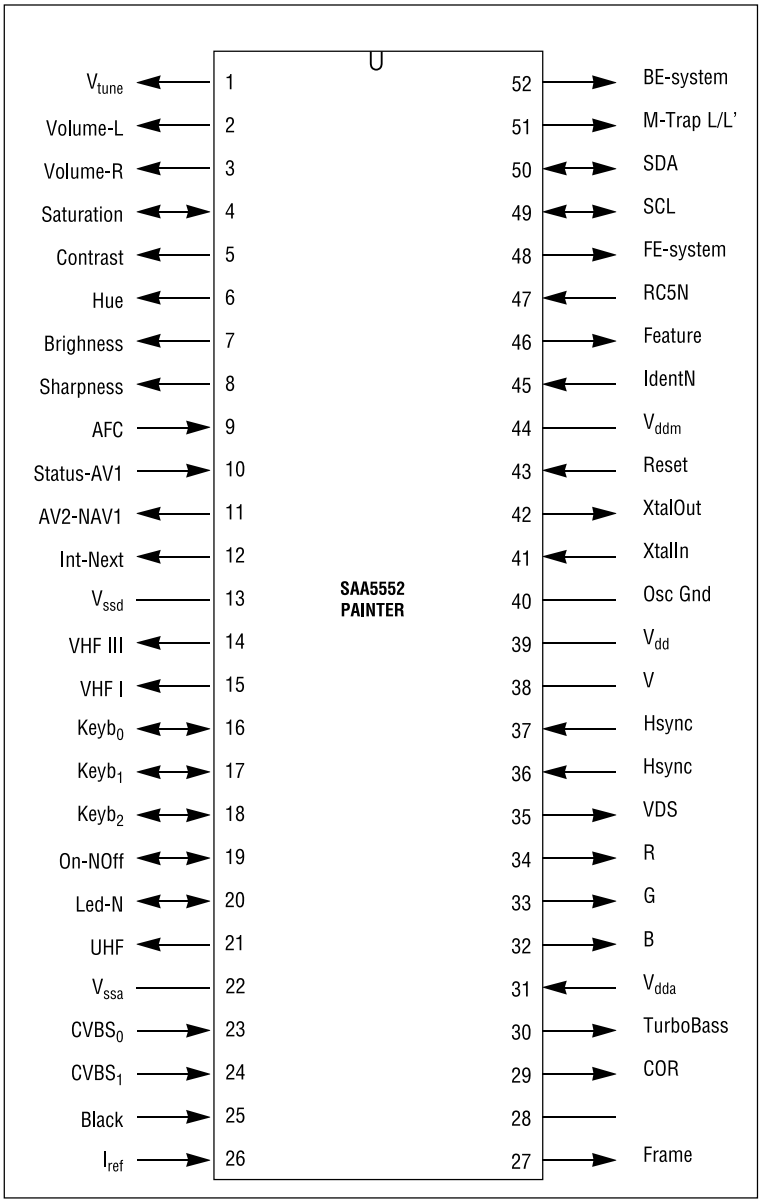
PAINTER (Microcontroller)

Painter is a low cost television receiver control system, based on the SAA5552 microcontroller. It is a Voltage Synthesis Tuning (VST) system with on-screen-display (OSD) of all relevant control functions. Painter supports a stereo sound system, based on a TDA9840 German Stereo decoder and a SAA7283 Nicam decoder. When the TV audio processor TDA9860 is present on the I^2C-bus. It will control bass and treble. Instead, stereo sound volume can also be controlled by two on-chip DACs, Analogue picture settings are controlled by 6 on-chip digitali-to-analogue converters.

Painter can two control SCART connections. Teletext is done by the Painter on-chip teletext interface.The user interface is menu-controlled for easy access with a reduced number of remote or local control keys.

The system supports automatic multi-system handling.

DIP Pin Connections



Pin Description (Microcontroller)

CTV811S pins	Pin name	Signal name	I/O	Function
1	P2.0/TPWM	VTUNE	0	VST tuning PWM
2	P2.1/PWM0	VOL-L	0	Sound volume for mono tuset
3	P2.2/PWM1	NC	0	
4	P2.3/PWM2	SATURATION	I/0	Saturation PWM output
5	P2.4/PWM3	CONTRAST	0	Contrast PWM
6	P2.5/PWM4	HUE	0	Hue PWM
7	P2.6/PWM5	BRIGHTNESS	0	Brightness PWM
8	P2.7/PWM6	SHARPNESS	0	Peaking: 0; Off, 1: Onf
9	P3.0/ADC0	XC	I	Analogue AFC input
10	P3.1/ADC1	AV1 STATUS		1: Source Off, 0: Source Active
11	P3.20/ADC2	AV2 - NAV1	0	AV2 control
12	P3.3/ADC3	INT-NEXT	0	
13	Vssc	-	-	Digital ground for teletext and microcontroller circuitry
14	P00	VHF III	0	Tuner band select
15	P0.1	VHF I	-	Tuner band select
16	P0.2	KEYB0	I/0	
17	P0.3	KEYB1	I/0	
18	P0.4	KEYB2	I/0	
19	P0.5	On-Noff	I/0	Power mode
20	P0.6	LEN-N	I/0	NC
21	P0.7	UHF	0	Tuner band select
22	Vssa	Vssa	-	Analogue ground
23	CVBS0	CVBS0	I	CVBS from tuner
24	CVBS1	CVBS1	I	CVBS from scart
25	SYNC FILTER	SYNC FILTER	I	CVBS black level
26	IRef	IRef	I	Reference current for analogue circuits
27	Frame	Frame	0	For non-interlaced circuits
28	-	-	-	-
29	COR	COR	0	NC
30	P3.4PWM7	TurboBass	0	NC
31	Vdda	Vdda	I	Drive (high) level for RGB outputs
32	B	B	0	Blue
33	G	G	0	Green
34	R	R	0	Red
35	VDS	VDS	0	Blanking
36	Hsync	Hsync	I	Horizontal Synchronisation
37	Vsync	Vsync	I	Vertical Synchronisation
38	Vssp	Vssp	-	Anologue supply voltage
39	Vddc	Vddc	-	Digital supply voltage for teletext
40	OscGND	OscGND	-	Oscillator ground
41	Xtalin	Xtalin	I	Oscillator input (12MHz)
42	Xtalout	Xtalout	0	Oscillator output
43	Reset	Reset		Reset
44	VDDp	Vddp		Digital supply voltage for microcontroller
45	P1.0/INT1	Ident	I	Horizontal Ident: 0: Fail, 1:OK
46	P1.1/TO	Feature	0	Feature: 0: 6/9,1: 4/3
47	P1.2/INT0	RC5N	I	RC5 signal
48	P1.3/T1	FE-system	0	Front-end selection
49	P1.6/SCL0	SCL	I/0	I :C Clock
50	P1.7/SDA0	SDA	I/0	I :C Data
51	P1.4/SCL1	M-Trap	0	M:Trap or L/L'
52	P1.5/SDA1	BE-System	0	Back-end selection

TDA4605

Power Supply

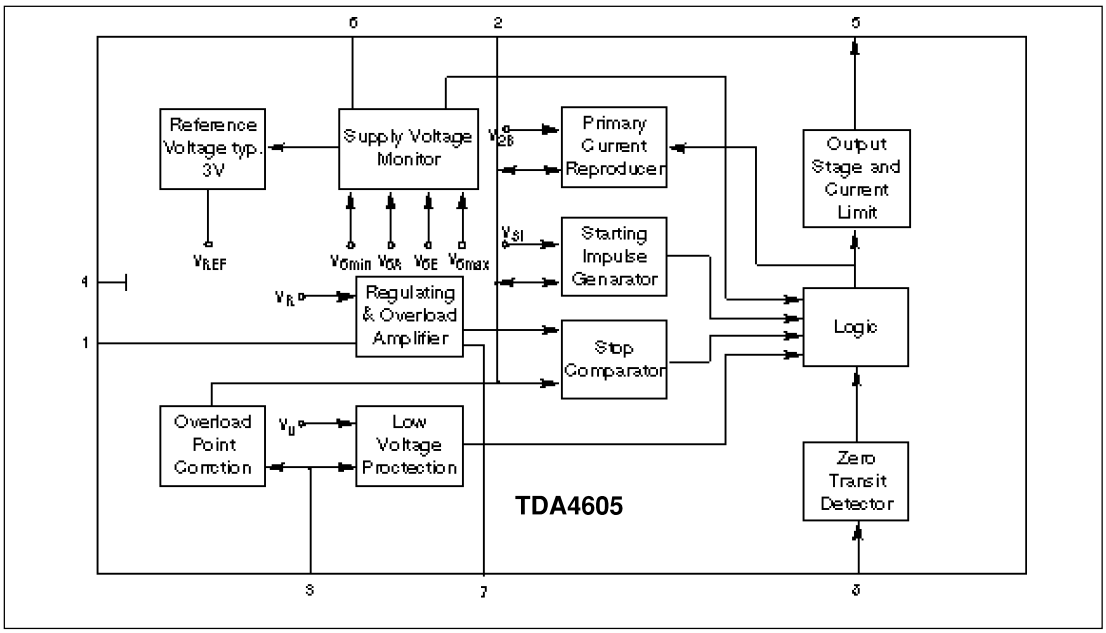
The IC TDA 4605 controls the MOS power transistor and performs all necessary regulation and monitoring functions in free running flyback converters.

Features

- Overload protection
- Burst operation under short circuit conditions
- Loop error protection
- Switch-off if line voltage is too low
- Line voltage compensation of overload point
- Soft start for quite start up
- Chip over temperature protection
- On-chip parasitic transformer oscillation suppression circuit

TDA 4605-3

PINNING		PIN VOLTAGE	
		ST-BY	NORM.
1	Information Input Concerning Secondary Voltage	0.4V	0.4V
2	Information Input Regarding the Primary Current	1V	1.2V
3	Input for Primary Voltage Monitor	2.1V	2V
4	Ground	0V	0V
5	Output	0.8V	8V (10Vpp)
6	Supply voltage Input	12V	12.8V
7	Input for Soft-Start and Integrator Circuit	1.1V	1.9V
8	Input for the Feedback of the Oscillator	0.3V	0.4V



Pin Definitions and Functions

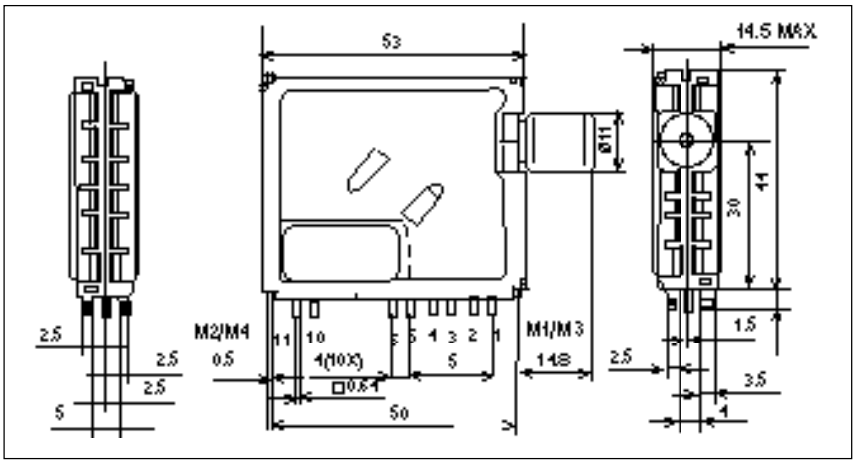
Pin No.	Function
1	**Information Input Concerning Secondary Voltage** By comparing the regulating voltage - obtained trom the regulating winding of the transformer - with the internal reference voltage, the output impulse width on pin 5 is adjusted to the load of the secondary side (normal, overload, short-circuit, no load).
2	**Information Input Regarding the Primary Current** The primary current rise in the primary winding is simulated at pin 2 as a voltage rise by means of external RC-element. When a voltage level is reached thats derived from the regulating voltage at pin 1, the output impulse at pin 5 is terminated. The RC-element serves to set the maximum power at the overload point set.
3	**Input for Primary Voltage Monitoring** In the normal operation V3 is moving between the thresholds V3H and V3L (V3H > V3 > V3L)- V3 < V3L: SMPS is switched OFF (line voltage too low). V3 > V3H : Compensation of the overload point regulation (controlled by pin 2) starts at V3H : V3L = 1.7.
4	**Ground**
5	**Output** Push-pull output provides ±1 A for rapid charge and discharge of the gate capacitance of the power MOS-transistor.
6	**Supply Voltage Input** A stable internal reference voltage VREF is derived from the supply voltage also the switching thresholds V6A, V6E, V6 max and V6 min for the supply voltage detector. If V6 > V6E then VREF is switched on and swiched off when V6 < V6A - In addition the logic is only enable for V6 min < V6 < V6 max-
7	**Input for Soft-Start** Start-up will begin with short pulses by connecting a capacitor from pin 7 to ground.
8	**Input for the Oscillation Feedback** After starting oscillation, every zero transition of the feedback voltage (falling edge) through zero (failing edge) triggers an output pulse at pin 5. The trigger threshold is at + 50 mV typical.

TUNER (World Standard)

Specifications

TV STANDARD		B, G, H, D, K, I, I', L, L'
Channels (Ch)	Low	CH2 - S10 (48.25 MHz - 168.25 MHz)
	Mid	E5 - S41 (175.25 MHz - 447.25 MHz)
	High	CH21 - E69 (455.25 MHz - 855.25 MHz)
IF Frequencies	Picture	38.90 MHz
	Sound	33.40 MHz
Input Impedance		75 Ohm unbalanced
Output Impedance		75 Ohm unbalanced, balanced
Input VSWR	All channels	max. 5
Noise Figure	All channels	typ. 6 dB
Gain	All channels	min. 38 dB, max. 50 dB
Image Rejection	Ch 2 - S20	min. 70 dB
	Ch S21 - S41	min. 66 dB
	Ch 21 - E69	min. 50 dB
IF Rejection	All channels	min. 60 dB
Supply Voltage		+5V DC

TERMINAL		DESCRIPTION
1	AGC	AGC Voltage
2	TU	Tuning Voltage
3	HIGH	Bandswitch - High
4	MID	Bandswitch - Mid
5	LOW	Bandswitch - Low
6	B+	Supply Voltage
10	IF2/GND	IF2 Output / Ground
11	IF1	IF1 Output
M1..M4	GND	Mounting Tags

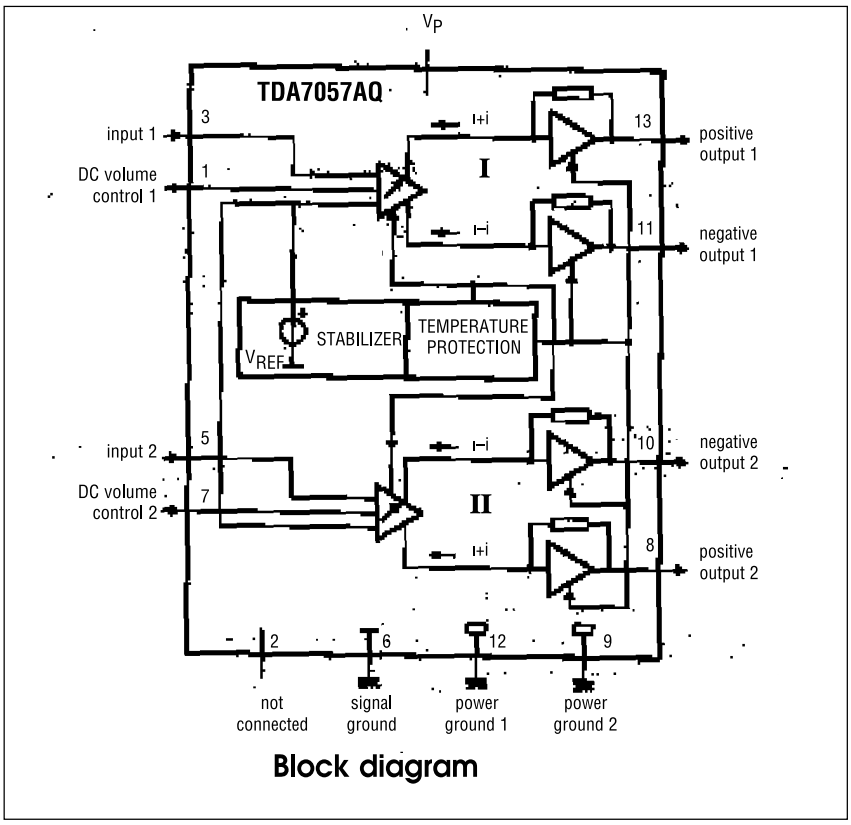


TDA 7057AQ

Audio Output Amplifiers

TDA 7056A Audio amplifier is used on mono TV sets. Output is 4 W RMS on 16 Ohms speaker at 10 % THD.
On stereo models TDA 7057AQ is used . Outputs are 2X4 W RMS on 8 Ohms speakers at 10 % THD.

PINNING		PIN VOLTAGE
1	DC volume control 1	: 1.0V
2	Not connected	: -
3	Voltage input 1	: 1.5Vpp
4	Positive supply Voltage	: 12.5V
5	Voltage input 2	: 1.5Vpp
6	Signal ground	: -
7	DC volume control 2	: 1.0V
8	Positive output 2	: -
9	Power ground 2	: -
10	Negative output 2	: -
11	Negative output 1	: -
12	Power ground 1	: -
13	Positive output 1	: -



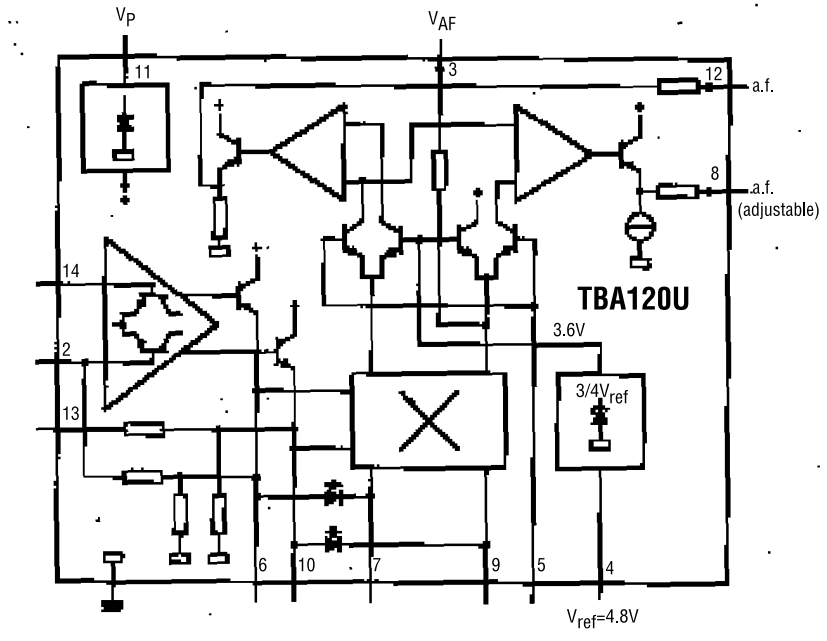
Block diagram

TBA120U

The TBA120U is an IF amplifier with a symmetrical FM demodulator and an AF amplifier with adjustable output voltage.

TBA 120U

PINNING		PIN VOLTAGE
1	Ground	: 0V
2	Mute	: -
3	Input resistance	: -
4	Supply current and the reference	: -
5	Adjustment voltage	: -
6	IF output voltage	: -
7	Tank to reference	: -
8	Adjustable output	: -
9	Tank to reference	: -
10	IF output voltage	: -
11	Positive supply	: 12V
12	De-emphesize out	: 0.5Vpp
13	SIF input	: -
14	SIF input	: -



Block diagram

TDA7056A

3 W BTL mono audio output amplifier with DC volume control

FEATURES

- DC volume control
- Few external components
- Mute mode
- Thermal protection
- No switch-on/off clicks
- Good overall stability
- Low power consumption
- Low HF radiation
- ESD protected on all pins.

GENERAL DESCRIPTION

The TDA7056A is a mono BTL output amplifier with DC volume control. It is designed for use in TV and monitors, but also suitable far battery-fed portable recorders and radios.

Missing Current Limiter (MCL)

A MCL protection circuits is built-in. The MCL circuit is activated when the difference in current between the output terminal of each amplifier exceeds 100 mA (typical 300 mA). This level of 100 mA allows for headphone applications (single-ended).

QUICK REFERENCE DATA

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_P	positive supply voltage range		4.5	-	18	V
P_O	output power	R_L=16Ω; V_p = 12V	3	3.5	-	W
G_v	voltage gain		34.5	35.5	36.5	dB
f	gain control range		75	80	-	dB
I_p	total quiescent current	V_p = 12V; R_L = •	-	8	16	mA
THD	total harmonic distortion	V_p = 0.5W	-	0.3	1	%

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA7056A	9	SIL	plastic	SOT110

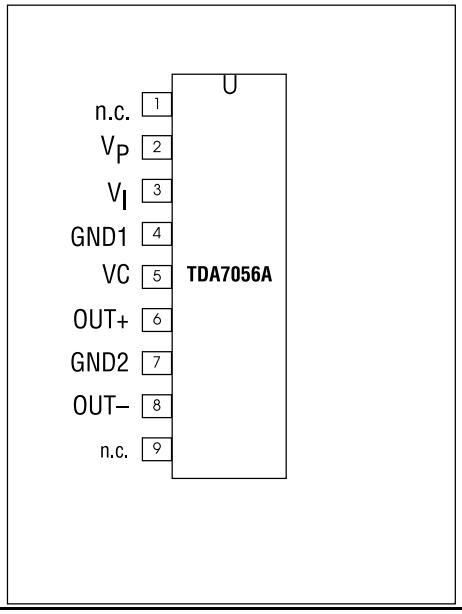
Note

1. SOT110-1; 1996 August 21.

PINNING

PIN	SYMBOL	DESCRIPTION
1	n.c	not connected
2	Vp	positive sbupply voltage
3	V_I	voltage input
4	GND1	signal ground
5	VC	DC volume control
6	output (+)	positive output
7	GND2	power ground
8	output (–)	negative output
9	n.c.	not connected

Pin Configuration



CHARACTERISTICS

Vp = 12V; f= 1 kHz; RL = 16Ω At T_{amb} = 25 °C;unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_P	positive supply voltage range		4.5	–	18	V
I_p	total quiescent current	Vp = 12V; RL = ∞; note 1	–	8	16	mA
Maximum gain (V5 = 1.4V)						
P_o	output power					
		THD = 10%; RL = 16Ω	3	3.5	–	W
		THD = 10%; RL = 8Ω	–	5.2	–	W
THD	total harmonic distortion	P_o = 0.5W	–	0.3	1	%
G_v	voltage gain		34.5	35.5	36.5	dB
V_I	input signal handling	V_5 = 0.8V; THD < 1%	0.5	0.65	–	V
Vno(rms)	noise output voltage (RMS value)	f = 500 kHz; note 2	–	210	–	µV
B	bandwidth	at–1dB	–	20Hz to 300 kHz	–	
SVRR	supply voltage ripple rejection	note 3	38	46	–	dB
Voff	DC output offset voltage		-	0	150	mV
Z_i	input impedance pin 3		15	20	25	kΩ
Minimum gain (V_5 = 0.5V)						
G_v	voltage gain		–	-44	–	dB
Vno(rms)	noise output voltage (RMS value)	note 4	–	20	30	µV
Mute position						
V_o	output voltage in mute position	$V_5 \leq$ 0.3V; V_I = 600mV	–	–	30	µV
DC volume control						
f	gain control range		75	80	–	dB
I5	control current	V_5 = 0V	60	70	80	µA

Notes to the characteristics

1. With a load connected to the outputs the quiescent current will increase, the maximum value of this increase being equal to the DC output offset voltage divided by R_L.
2. The noise output voltage (RMS value) at f = 500 kHz is measured with R_S = 0 Ω and bandwidth = 5 kHz.
3. The ripple rejection is measured with R_S = 0 Ω and f = 100 Hz to 10 kHz. The ripple voltageof 200 mV (RMS value) is applied to the positive supply rail.
4. The noise output voltage (RMS value) is measured with R_S=5kΩ unweighted.

FUNCTIONAL DESCRIPTION

The TDA7056A is a mono BTL output amplifier with DC volume control, designed for use in TV and monitor but also suitable for battery-fed portable recorders and radios.

In conventional DC volume circuits the control or input stage is AC coupled to the output stage via external capacitor to keep the offset voltage low.

In the TDA7056A the DC volume stage is integrated into the input stage so that coupling capacitors are not required and a low offset voltage is maintained.

At the same time the minimum supply voltage remains low.

The BTL principle offers the following advantages:

- lower peak value of the supply current
- the frequency of the ripple on the supply voltage is twice the signal frequency

Thus, a reduced power supply and smaller capacitors can be used which results in cost savings.

For portable applications there is a trend to decrease the supply voltage, resulting in a reduction of output power at conventional output stages. Using the BTL principle increases the output power.

The maximum gain of the amplifier is fixed at 35.5 dB. The DC volume control stage has a logarithmic control characteristic.

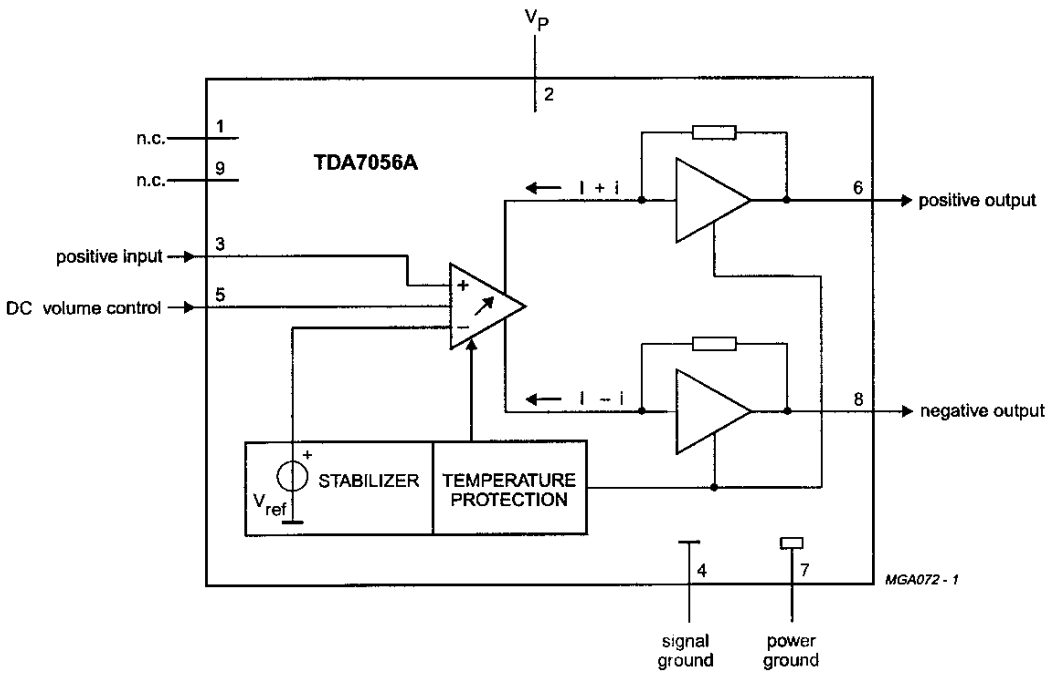
The total gain can be controlled from 35.5 dB to -44 dB.

If the DC volume control voltage is below 0.3 V, the device switches to the mute mode.

The amplifier is short-circuit proof to ground, Vp and across the load. A thermal protection circuit is also implemented. If the crystal temperature rises above +150 °C the gain will be reduced, thereby reducing the output power.

Special attention is given to switch-on and off clicks, low HF radiation and a good overall stability.

Block Diagram



LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_P	positive supply voltage range		-	18	V
I_{ORM}	repetitive peak output current		-	1.25	A
I_{OSM}	non repetitive peak output current		-	1.5	A
Ptot	total power dissipation	Tcase < 60 °C	-	9	W
T_{amb}	operating ambient temperature range		-40	+85	°C
T_{stg}	storage temperature range		-55	+150	°C
T_{vj}	virtual junction temperature		-	+150	°C
T_{sc}	short-circuit time		-	1	hr
V_3	input voltage pin 3		-	8	V

THERMAL RESISTANCE

Symbol	Parameter	Thermal Resistance
Rth j-a	from junction to ambient in free air	55K/W
Rth j-c	from junction to case	10K/W

Note to the resistance

V_P = 12V; R_L = 16Ω; The maximum sine-wave dissipation is = 1.8 W. The $R_{th\ vj\text{-}a}$ of the package is 55 K/W;

$T_{amb\ (max)}$ = 150 - 55 x 1.8 = 51 °C

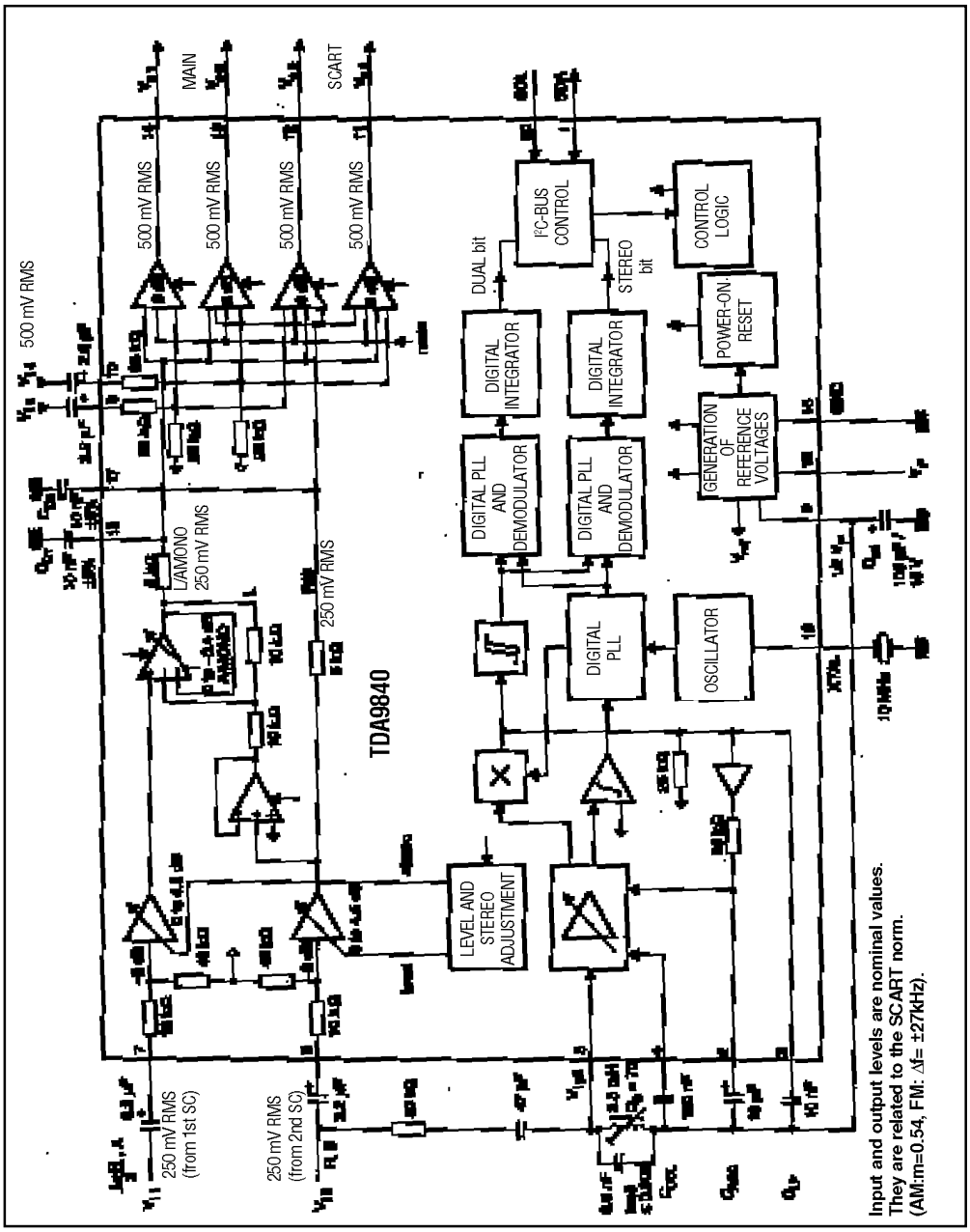
STEREO PART

TDA 9840 is used as German Stereo decoder and SAA 7283 is used Nicam decoder via I²C bus interface. On outputs of G/S and Nicam decoder IC's, TDA 8425 sound processor is used . Also this IC controls via I²C bus.

TDA 9840

PINNING		PIN VOLTAGE
1	I²C-bus data input/output	: 5Vpp
2	AGC capacitor of pilot frequency amplifier	: -
3	Identification low-pass capacitor	: -
4	DC loop capacitor	: -
5	Pilot frequency input input voltage	: -
6	Capacitor of reference voltage (1/2 Vp)	: 2.5V
7	AF input signal Vi_1 (from 1st sound carrier)	: 0.25 Vpp
8	AF input signal Vi_2 (from 2nd sound carrier)	: 0.25 Vpp
9	AF input signal Vi_3 (NICAM or AM sound (standard L)	: -
10	AF input signal Vi_4 (NICAM)	: -
11	AF output signal Vo_4 (SCART)	: 1.0 Vpp
12	AF output signal Vo_3 (SCART)	: 1.0 Vpp
13	AF output signal Vo_2 (main)	: 0.5 Vpp
14	AF output signal Vo_1 (main)	: 0.5 Vpp
15	50 us de-emphasis capacitor of AF Channel 1	: -
16	Ground	: 0V
17	50 us de-emphasis capacitor of AF Channel 2	: -
18	Supply voltage (+5 to +8V)	: 5V
19	10 MHz crystal input	: -
20	I²C-bus clock input	: 5V

Block diagram



Block diagram of the biplar TV/VTR-stereo decoder

TDA9860

Universal HiFi audio processor for TV

FEATURES

- Multi-source selector switches six AF inputs (three stereo sources or six mono sources)
- Each of the input signals can be switched to each of the outputs (crossbar switch)
- Outputs for loudspeaker channel, headphone channel and peri-TV connector (SCART)
- Switchable spatial stereo and pseudo stereo effects
- Audio surround decoder can be added externally
- Two general purpose logic output ports
- I^2C-bus control of all functions.

GENERAL DESCRIPTION

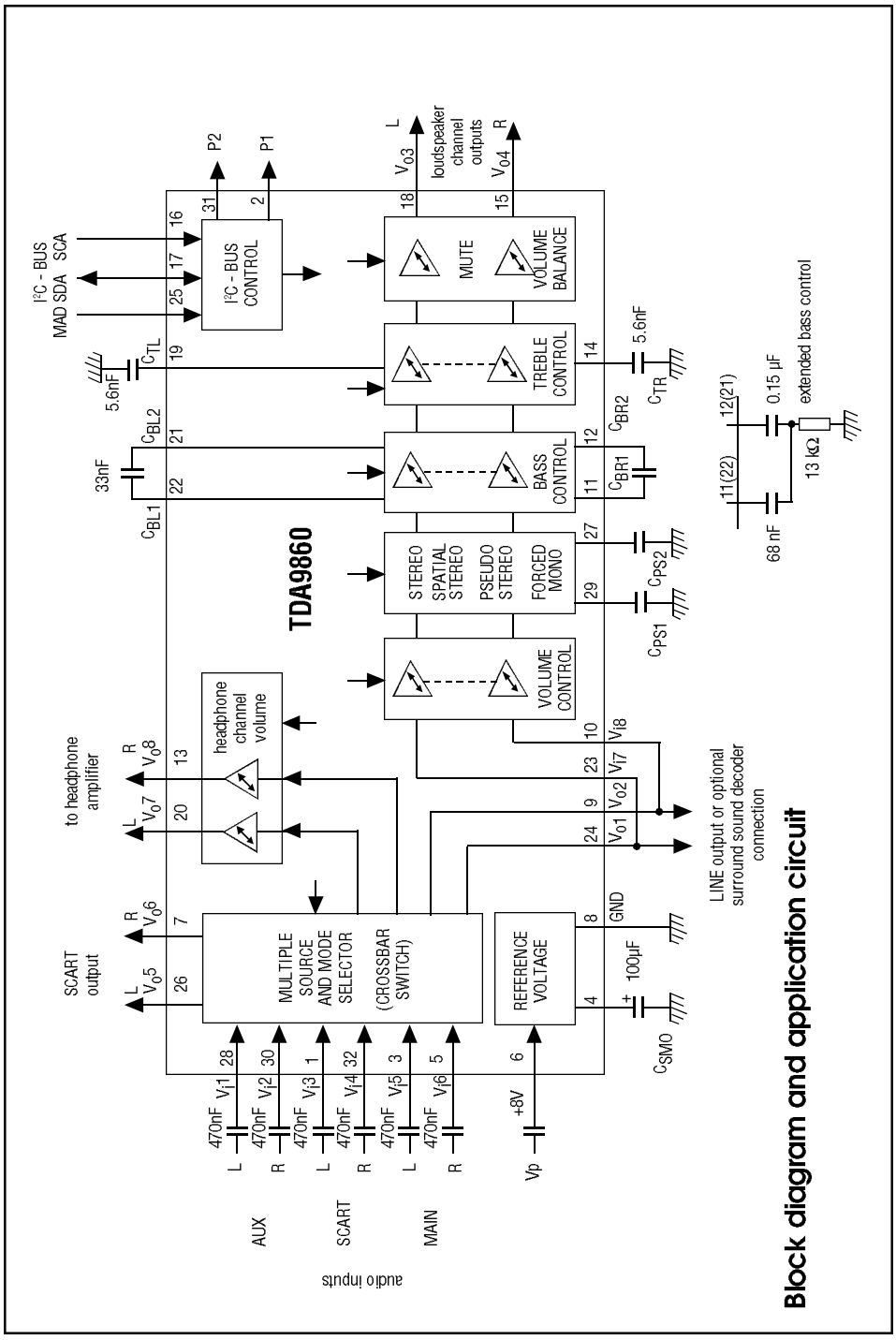
The TDA9860 provides control facilities for the main, the headphone and the SCART channel of a TV set. Due to extended switching possibilities, signals from 3 stereo sources can be handled.

QUICK REFERENCE DATA

Symbol	Parameter	Min.	Typ.	Max.	Unit
VP	positive supply voltage (pin 6)	7.2	8.0	8.8	V
IP	supply current	-	25	-	mA
Vi	input signal levels for 0 dB gain (RMS value)	2	-	-	V
Vo	output signal levels for 0 dB gain (RMS value)	2	-	-	V
Gv	gain in main channel				
	volume control (1 dB steps, balance included)	-63	-	+15	dB
	bass control (1.5 dB steps)	-12	-	+15	dB
	treble control (3 dB steps)	-12	-	+12	dB
	gain in headphone channel				
	volume control (2 dB steps)	-70	-	0	dB
	gain for muting in all channels	-80	-	-	dB
THD	total harmonic distortion	-	0.1	-	%
S/N	signal-to-noise ratio	-	85	-	dB
Tamb	operating ambient temperature	0	-	+70	°C

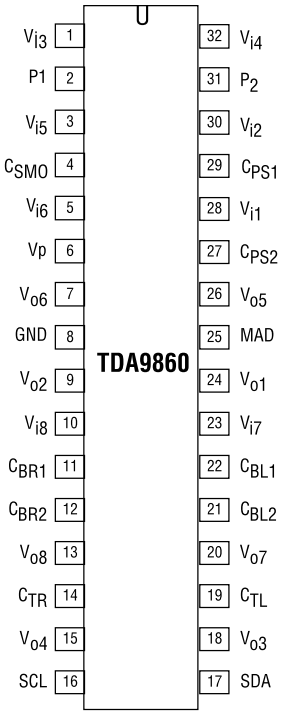
ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA9860	32	SDIL	plastic	SOT232 (1)


TDA9860
I²C - BUS
MAD SDA SCA
I²C - BUS CONTROL
MUTE
VOLUME BALANCE
TREBLE CONTROL
BASS CONTROL
STEREO
SPATIAL STEREO
PSEUDO STEREO
FORCED MONO
VOLUME CONTROL
headphone channel volume
MULTIPLE SOURCE AND MODE SELECTOR
(CROSSBAR SWITCH)
REFERENCE VOLTAGE
loudspeaker channel outputs
to headphone amplifier
SCART output
LINE output or optional surround sound decoder connection
extended bass control
audio inputs
AUX
SCART
MAIN
Block diagram and application circuit

PINING

PIN	DESCRIPTION	SYMBOL
1	Scart input signal LEFT	V_{i3}
2	Port 1 Output	P1
3	Main input signal LEFT	V_{i5}
4	Smoothing capacitor of reference voltage	C_{SMO}
5	Main input signal RIGHT	V_{i6}
6	Positive supply voltage	Vp
7	Scart output signal RIGHT	V_{o6}
8	Ground	GND
9	MAIN output signal RIGHT	V_{o2}
10	Input signal RIGHT to loudspeaker channel	V_{i8}
11	Bass capacitor RIGHT 1	C_{BR1}
12	Bass capacitor RIGHT 2	C_{BR2}
13	Headphone output signal RIGHT	V_{o8}
14	Treble capacitor RIGHT	C_{TR}
15	Loudspeaker channel output signal RIGHT	V_{o4}
16	I^2C-bus clock line	SCL
17	I^2C-bus data line	SDA
18	Loudspeaker channel output signal LEFT	V_{o3}
19	Treble capacitor LEFT	C_{TL}
20	Headphone output signal LEFT	V_{o7}
21	Bass capacitor LEFT 1	C_{BL2}
22	Bass capacitor LEFT 2	C_{BL1}
23	Input signal LEFT to loudspeaker channel	V_{i7}
24	MAIN output signal LEFT	V_{o1}
25	Module address select input	MAD
26	Scart output signal LEFT	V_{o5}
27	Pseudo stereo capacitor 2	C_{PS2}
28	AUX input signal LEFT	V_{i1}
29	Pseudo stereo capacitor 1	C_{PS1}
30	AUX input signal RIGHT	V_{i2}
31	Port 2 output	P_2
32	Scart input signal RIGHT	V_{i4}



Pin configuration

SAA7283
Terrestrial Digital Sound Decoder (TDSD3)

FEATURES

- Single chip solution including FM and vision filters, analogue demodulator and audio switching.
- Dual standard with automatic selection between PAL system I and BGH including French NICAM L system)
- Single low-radiation crystal oscillator for improved EMC.
- Stereo bitstream audio DACs.
- Programmable attenuator for matching levels of NICAM and FM audio sources at the output of the device.
- Full EBU NICAM 728 specification demodulation and decoding.
- Digital Audio Interface conforming with EBU/IEC 958.
- Auto-mute function which switches from NICAM to FM sound when NICAM fails.
- Compatible with either single-ended or differential DQPSK input signals.
- Microcomputer controlled via I²C (up to 400 kHz specification)

APPLICATIONS

* Television Receivers.

* Video Cassette Recorders.

GENERAL DESCRIPTION

The SAA7283 is a NICAM receiver solution, developing the well established high quality Terrestrial Digital Sound decoder family from Philips Semiconductors .

This innovative IC with analog front - end, offers more impressive features and flexibility with minimum external circuitry

The SAA7283 takes, as input, a second IF (intercarrier) Terrestrial TV PAL signal, and performs all the Differential Quadrature Phase Shift Keying (DQPSK) demodulation, digital decoding and digital-to-analog conversion necessary to produce a complete NICAM receiver on a single integrated circuit.

The demodulator function includes integrated beseband filters for pulse shaping and unwanted signal rejection, automatic gain control, a low jitter integrated VCO, digital monostable for precise data sampling points and a multi-standard controller to enable automatic locking to either a PAL system I or PAL system BGH input signal.(including French NICAM L system).

The decoder function performs the descrambling, de-interleaving and reformatting operations required to recover the original data words.

The data words are processed through a stereo digital filter, digital de-emphasis network, second order noise shaper and 256 times oversampling Bitstream audio DAC.

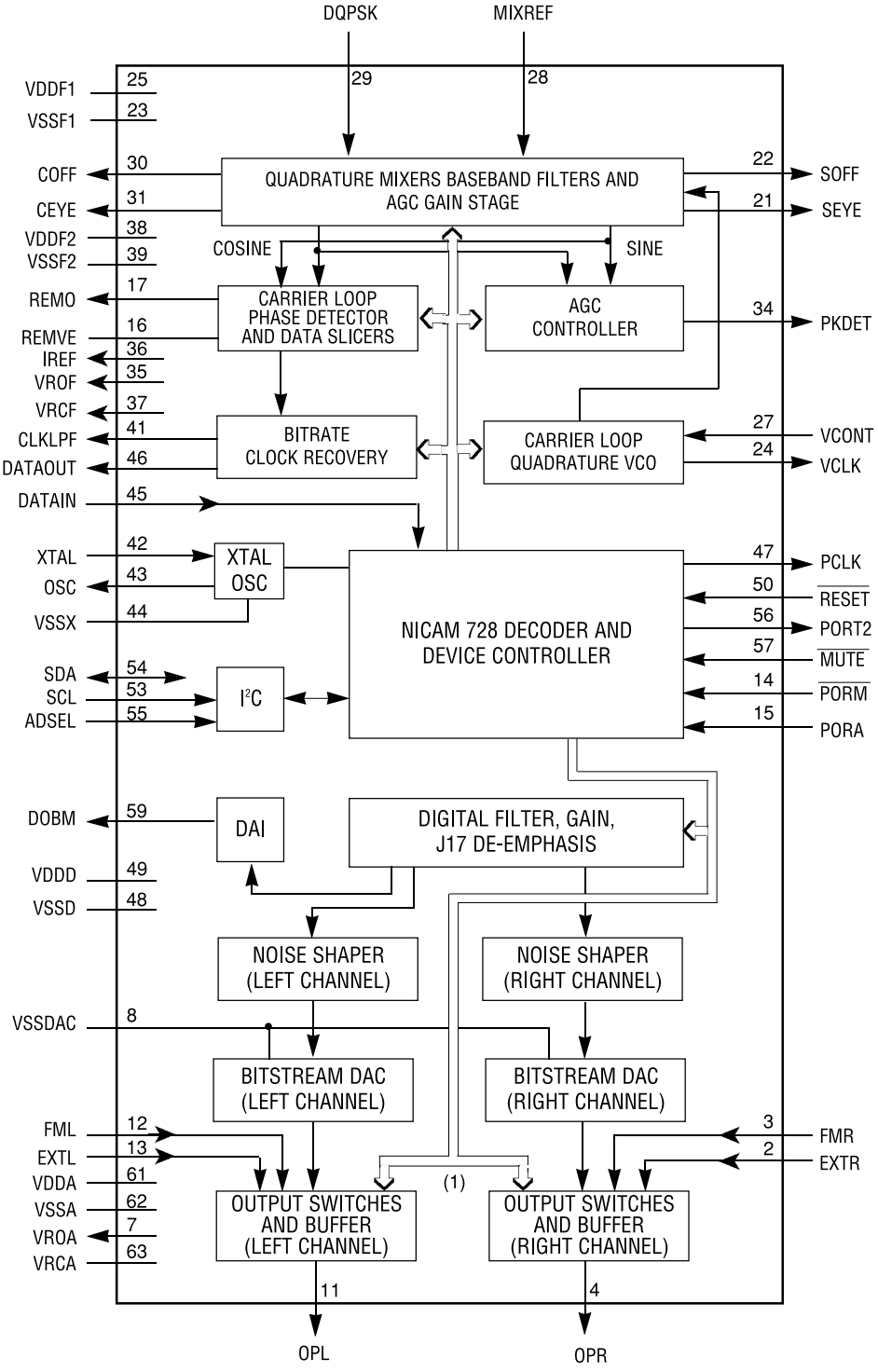
The SAA7283 then provides a switching output buffer for selecting between FM, NICAM and daisy chain inputs, and a programmable level attenuation matrix for matching levels of the FM and NICAM audio sources at the output of the device. An additional feature is the inclusion of a Digital Audio interface (DAI) output IEC958, which may be disabled if required.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP	MAX.	UNIT
V_{DD}	supply voltage	4.5	5.0	5.5	V
I_{DD}	supply current	-	205	-	mA
f_{clk}	clock frequency	-	8.192	-	MHz
T_{amb}	operating ambient temperature	-20	+25	+70	°C

Block Diagram)

SAA7283GP

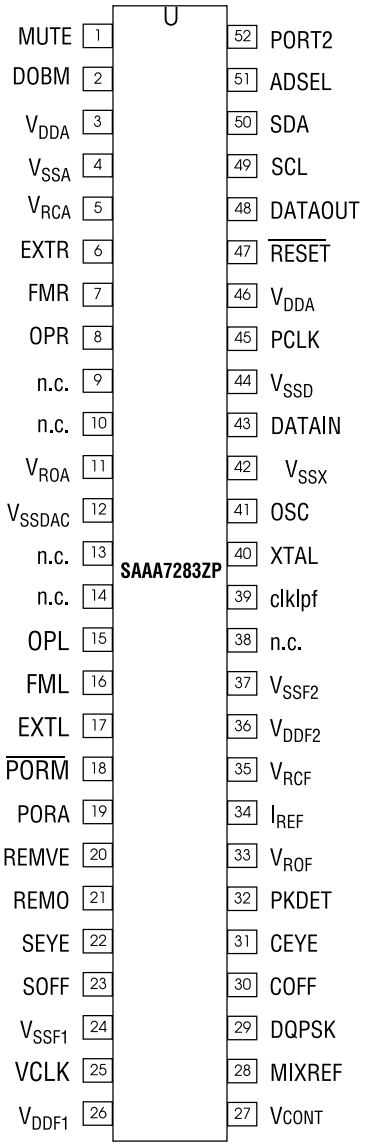


(1) REPRESENTS CONTROLLER BUS

PINNING

SYMBOL	PIN		DESCRIPTION
	SDIP52	QFP64[1]	
$\overline{\text{MUTE}}$	1	57	active LOW mute input; function defined by MUTEDEF (control bit in the I²C-bus register)
DOBM	2	59	digital audio interface output that can be 3-stated via I²C-bus
VDDA	3	61	analog supply voltage for the audio channels
VSSA	4	62	analog ground connection for the audio channels
VRCA	5	63	internal audio reference voltage buffer (high-impedance node)
EXTR	6	2	external analog input to the right audio channel
FMR	7	3	FM sound input to the right audio channel
OPR	8	4	analog output from the right audio channel
n.c.	9 and 10	9 and 10	not connected; left open circuit in application.
VROA	11	7	internal audio reference voltage buffer output
VSSDAC	12	8	guiet ground connection to DACs
n.c.	13 and 14	-	not connected; left open circuit in application.
OPL	15	11	analog output from the left audio channel
FML	16	12	FM sound input to the left audio channel
EXTL	17	13	external analog input to the left audio channel
$\overline{\text{PORM}}$	18	14	active LOW power-on reset mute input; mute cleared by setting silence bit HIGH in I²C-bus. (internal pull-up)
PORA	19	15	Power-on reset audio select input (internal pull-up)
REMVE	20	16	carrier loop-filter connection
REMO	21	17	carrier loop-filter output
SEYE	22	21	sine channel eye pattern output for monitoring
SOFF	23	22	sine channel offset compensator capacitor output
VSSF1	24	23	demodulator ground connection 1
VCLK	25	24	carrier loop VCO clock output for monitoring
VDDF1	26	25	demodulator supply voltage 1
VCONT	27	27	carrier loop VCO control voltage input
MIXREF	28	28	mixer voltage reference or input when using differential DQPSK signal
DQPSK	29	29	DQPSK input signal
COFF	30	30	cosine channel offset compensator capacitor output
CEYE	31	31	cosine channel eye pattern output for monitoring
PKDET	32	34	AGC peak detector storage capacitor output
VROF	33	35	internal demodulator reference voltage buffered output
IREF	34	36	internal demodulator reference current output
VRCF	35	37	internal demodulator reference voltage unbuffered output
VDDF2	36	38	demodulator supply voltage 2
VSSF2	37	39	demodulator ground connection 2
n.c.	38	40	not connected - left open-circuit in application.
CLKLPF	39	41	clock loop-phase comparator output
XTAL	40	42	8.192 MHz crystal oscillator input
OSC	41	43	8.192 MHz crystal oscillator input
VSSX	42	44	crystal oscillator ground connection
DATAIN	43	45	serial data input at 728 kbits/s to decoder
VSSD	44	48	digital ground connection
PCLK	45	47	728 kHz output clock to DQPSK demodulator
VDDD	46	49	digital supply voltage
$\overline{\text{RESET}}$	47	50	active LOW power-on reset input
DATAOUT	48	46	serial data output at 728 kbits/s from DQPSK demodulator
SCL	49	53	serial clock input for I²C-bus
SDA	50	54	serial data input/output for I²C-bus
ADSEL	51	55	input that defines I²C-bus address bit 0 (internal pull-up)
PORT2	52	56	output that is directly controlled from port2 bit in I²C-bus

Note:
1. Pins 1, 5, 6, 18, 19, 20, 26, 32, 33, 51, 52, 58, 60 and 64 are not connected; left open-circuit in application.



Pin Configuration

FUNCTIONAL DESCRIPTION

DQPSK demodulation

QUADRATURE MIXERS, BASEBAND FILTERS AND AUTOMATIC GAIN CONTROL (AGC)

The DQPSK signal is fed into two differential input mixers, where it is mixed with quadrature phases generated by the carrier-loop quadrature VCO. The quadrature signals modulated onto the NICAM carrier are thus recovered.

The mixers can be driven by either a single-ended or differential source. In single-ended mode, the device is driven directly from the sound IF down-converter into the DQPSK input pin, with the MIXREF pin decoupled.

In differential mode, the signal is applied between the DQPSK and MIXREF pins.

The outputs from the mixers are then fed into a pulse-shaping filter, and FM/vision filter stage which filters out all interference components, including AM carrier for French NICAM L system. The signal from the filtering stages is then fed into the AGC, which ensures that the phase comparator gain remains constant, irrespective of the input signal level. This is important to maintain the stability of Costas loop PLL.

AGC CONTROLLER

The AGC controller monitors the I and Q channel signals at the input to the carrier loop-phase comparator and generates a reference voltage to set the AGC output level.

EYE BUFFER

A differential to the single-ended converter provides the baseband signal as an output at the pins CEYE and SEYE for the I and Q channels respectively for eye-height monitoring.

BIT RATE CLOCK RECOVERY

The I and Q channels are processed using edge detectors and monostables, which generate a signal with a coherent component at the data symbol rate. The outputs from the I and Q channel monostables are each compared with the clock derived from FOLK (364 kHz nominal), the resultant output is used to derive a 3-state control signal used to control two current sources at the CLKLPF output.

This error signal is loop filtered and used to control the master clock oscillator. The bit rate clock, PCLK, and symbol clock are derived from the master clock.

NICAM 728 decoding

DECODING FUNCTIONS

The device performs all decoding functions in accordance with the EBU NICAM 728 specification. After locking to the frame alignment word, the data is descrambled by application of the defined pseudo random binary sequence, and the device synchronizes to the periodic frame flag bit CO.

The relevant control information and scale factor word is extracted, and with the integrated RAM the data is de-interleaved and the scale factor word is extracted, and expanded to 14 bits. Parity checking on the eleventh bit of each sample word is carried out to reveal any sound sample errors, which if detected are flagged, with the last good sample being held.

Automatic muting

Enable when AMDIS = LOW. The I²C-bus section has two registers which define an upper and lower limit for the automatic muting function. When the number of errors within a 128 ms period exceeds the number stored in the upper error limit register, then the automatic muting will switch the device output to the FM input, (dependent on the relevant control bits in the I²C-bus) and mute (set to zero) the data input to the filter (in that order).

When the error count in a 128 ms period is less than the value stored in the lower error limit register then the data into the filter is uninterrupted, and the device output is switched back to the DAC (dependent on the value of the relevant control bits in the I²C-bus). During the muting operation the open-drain pin MUTE is pulled LOW and the AM bit in the status-byte is set HIGH. Figure 4 shows the dependency of the automatic muting function on error-count, RSSF, C40V, output state and application mode. The automatic mutingfunction, if enabled, will override user mute via the MUTE pin/bit.

When the transmission is DATA format or currently undefined format (C3 = logic1) the device will automatically switch to the FM inputs regardless of RSSF/C4OV states, and whether the automatic muting function AMDIS is enabled or disabled.

User mute

The error counter is an 8-bit counter which locks at count 255. The counter is reset and its output sent to the I²C-bus every 128 ms. This enables the user to interrogate the number of errors occurring within a 128 ms period. The user can then mute the device by pulling pin MUTE LOW (this function is also provided by the MUTE bit in the (I²C-bus) or setting SILENCE bit LOW in I²C-bus to switch input of audio switching buffers to analog ground.

Switching buffers

The analog switches select between the output of the DACs, the FM input and an external input (EXT). Switching is controlled by bits in the I²C-bus and internal switching function. The external analog inputs should be ≤1.1 V (RMS) at the input pin, and the output buffers have a voltage drive of 1 V (RMS).

NICAM/FM audio level matching

Differing audio headroom and alignment levels occur between systems I and BGH, due to the differing systems and broadcast standards. In order to match the NICAM and FM audio output levels without requiring application changes, the device will automatically switch in 4.6 dB attenuation network in the NICAM path for system BGH (this can be disabled by setting the NICLEV bit LOW in I²C-bus). A programmable attenuation network in the FM path only, controlled by bits in I²C-bus, provides additional flexibility for user to match FM and NICAM audio levels.

Power-on reset state

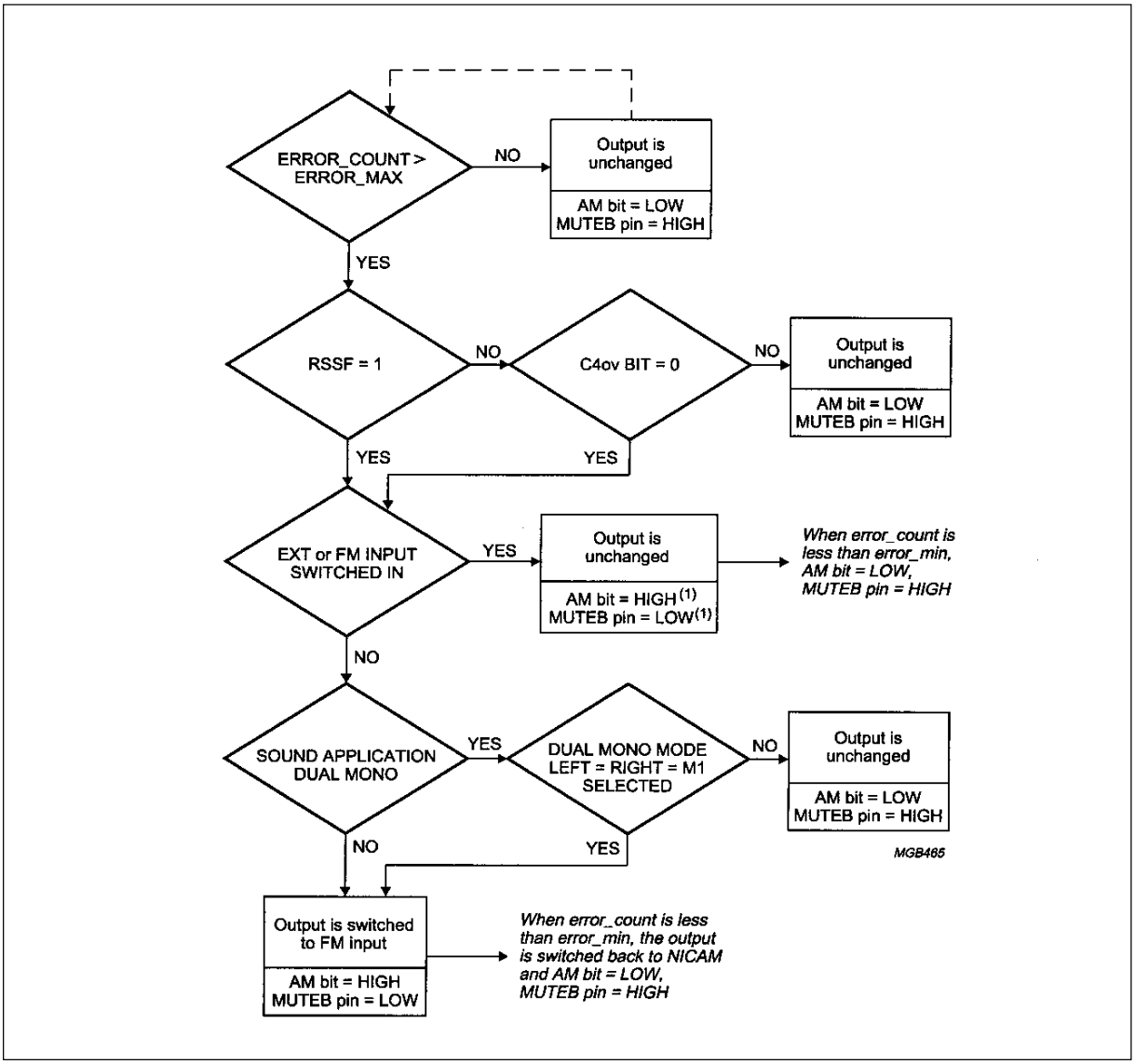
Two pins control the initial set-up of the device during power-on reset.

PORA (Power-On Reset Audio)

When pulled LOW the device will be configured with a 12 dB gain in the oversampling filter and the C40V bit in the I²C-bus will be set HIGH. This pin when HIGH will configure the device with a 6 dB gain in the oversampling filter and will set C4OV bit in the I²C-bus LOW.

PORM (Power-On Reset Mute)

This pin when LOW will mute the output of the device at power-on by setting the SILENCE bit in the I²C-bus LOW. To put the device back into a normal mode of operation the SILENCE bit in the I²C-bus must be set HIGH.



Flow diagram showing SAA7283 automatic muting function

TDA4470-M

Multistandard Video-If and Quasi Parallel Sand Processing

DESCRIPTION

The TDA4470B is an integrated bipolar circuit for multistandard video/sound IF (VIF/SIF) signal processing in TV/VCR and multimedia applications. The circuit processes all TV video IF signals with negative modulation (e.g., B/G standard), positive modulation (e.g., L standard) and the AM, FM/NICAM sound IF signals.

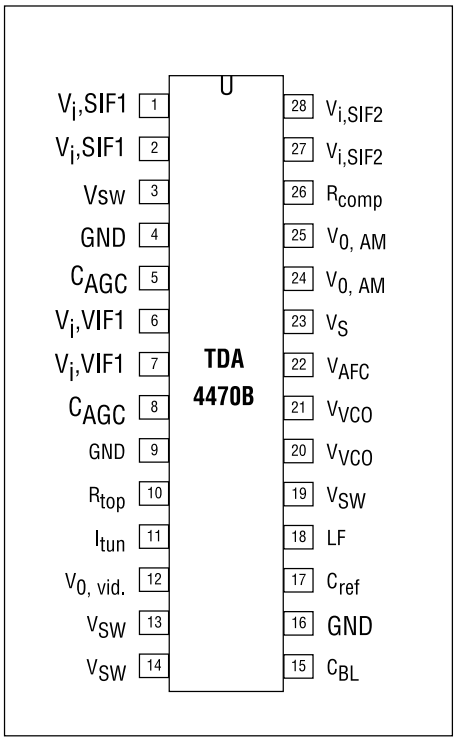
FEATURES

- 5 V supply voltage, low power consumption
- Active carrier generation by FPLL principle (frequency-phase-locked-loop) for true synchronous demodulation
- Very linear video demodulation, good pulse response and excellent intermodulation figures
- VCO circuit is operating on picture carrier frequency, the VCO frequency is switchable for the L` mode
- Alignment free AFC without external reference circuit, polarity of the AFC curve is switchable
- VIF AGC for negative modulated signals (peak sync. detection) and for positive modulation (peak white/black level detector)
- Tuner AGC with adjustable take over point
- Alignment free quasi parallel sound (QPS) mixer for FM/NICAM sound IF signals
- Intercarrier output signals is gain controlled (necessary for digital sound processing)
- Complete alignment-free AM demodulator with gain controlled AF output
- Separate SIF-AGC with average detection
- Two independent SIF inputs
- Parallel operation of the AM demodulator and QPS mixer (for NICAM-L stereo sound)
- Package and relevant pinning is compatible with t h e single standard version TDA4472, which simplifies the design of an universal IF module

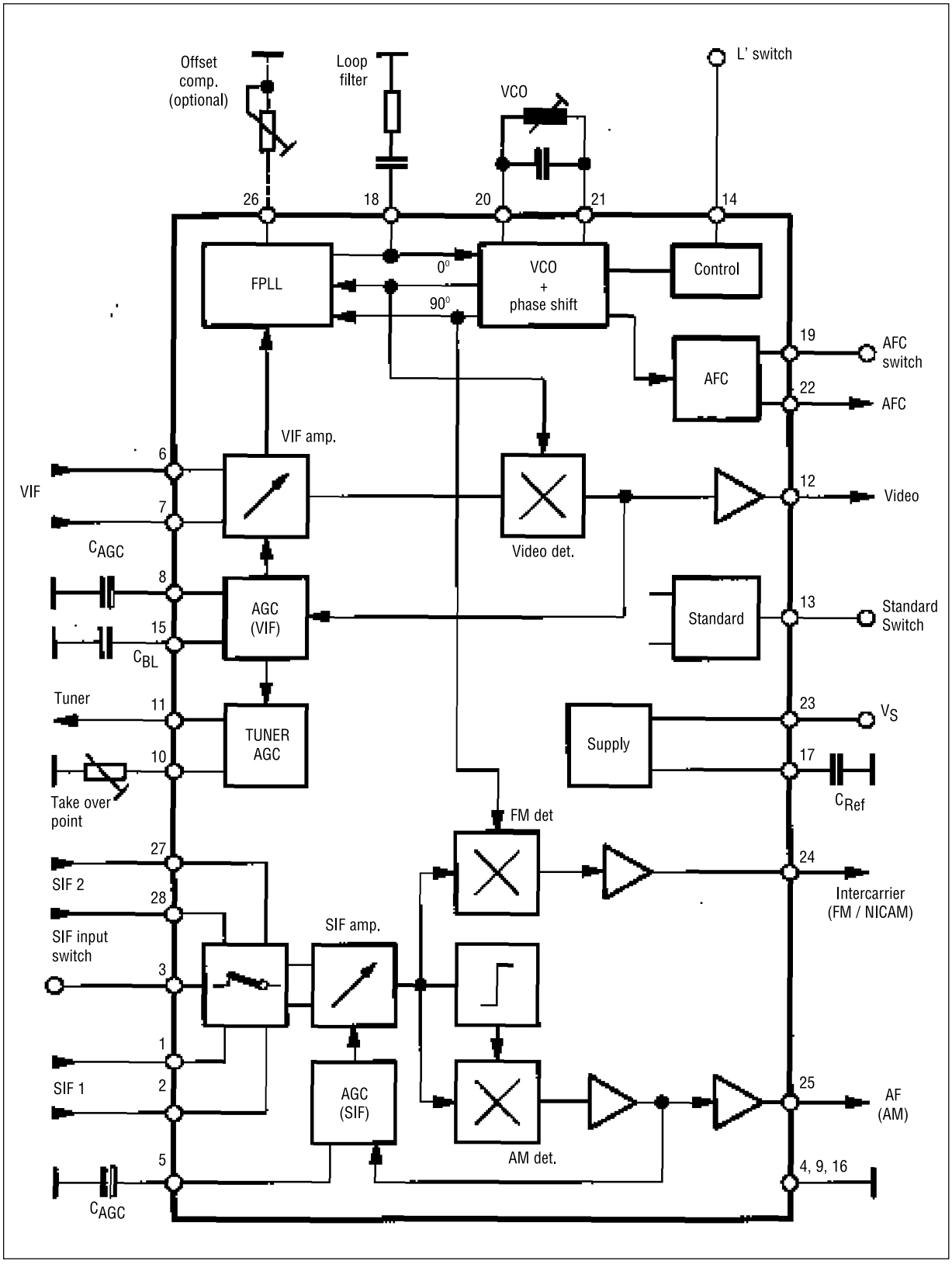
PINNING

Pin	Symbol	Function
1, 2	V_i,SIF1	SIF1 input (symmetrical)
3	Vsw	Input selector switch
4, 9,16	GND	Ground
5	C_{AGC}	SIF-AGC (time constant)
6, 7	V_i,VIF	VIF input (symmetrical)
8	C_{AGC}	VIF-AGC (time constant)
10	R_{top}	Take over point, tuner AGC
11	I_{tun}	Tuner AGC output current
12	V_0,vid	Video output
13	V_{SW}	Standard switch
14	V_{SW}	L' switch
15	C_{bi}	Black level capacitor
17	C_{ref}	Internal reference voltage
18	LF	Loop filter
19	V_{SW}	AFC switch
20.21	V_{VCO}	VCO circuit
22	V_{AFC}	AFC output
23	V_S	Supply voltage
24	$V_{0\text{-}FM}$	Intercarrier output
25	$V_{0\text{-}AM}$	AF output - AM sound
26	R_{comp}	Offset compensation
27, 28	$V_{i,\ SIF2}$	SIF2 input (symmetrical)

Pin Description



Block Diagram for TDA4470-M



CIRCUIT DESCRIPTION

Vision IF Amplifier

The video IF signal (VIF) is fed through a SAW filter to the differential input (Pin 6-7) of the VIF amplifier. This amplifier consists of three AC-coupled amplifier stages. Each differential amplifier is gain controlled by the automatic gain control (VIF-AGC). The output signal of the VIF amplifier is applied to the FPLL carrier generation and the video demodulator.

Tuner-and VIF-AGC

At Pin 8, the VIF-AGC charges/discharges the AGC capacitor to generate a control voltage for setting the gain of the VIF amplifier and tuner in order to keep the video output signal at a constant level. Therefore, in the case of all negative modulated signals (e.g., B/G standard) the sync. level of the demodulated video signal is the criterion for a fast charge/discharge of the AGC capacitor. For positive modulation (e.g., L standard) the peak white level of video signal controls the charge current. In order to reduce reaction time for positive modulation, where a large time constant is needed, an additional black level detector controls the discharge current in the event of decreasing VIF input signal. The control voltage (AGC voltage at Pin 8) is transferred to an internal control signal, and is fed to the tuner AGC to generate the tuner AGC current at Pin 11 (open collector output). The take over point of the tuner AGC can be adjusted at Pin 10 by a potentiometer or an external de voltage (from interface circuit or microprocessor).

FPLL, VCO and AFC

The FPLL circuit (frequency phase locked loop) consists of a frequency and phase detector to generate the control voltage for the VCO tuning. In the locked mode, the VCO is controlled by the phase detector and in unlocked mode, the frequency detector is superimposed. The VCO operates with an external resonance circuit (L and C parallel) and is controlled by internal varicaps. The VCO control voltage is also converted to a current and represents the AFC output signal at Pin 22. At the AFC switch (Pin 19) three operating conditions of the AFC are possible: AFC curve *"rising"* or *"falling"* and AFC "off'.

A practicable VCO alignment of the external coil is the adjustment to zero AFC output current at Pin 22. At center frequency the AFC output current is equal to zero. Furthermore. at Pin 14. the VCO center frequency can be switched for setting to the required L' value (L' standard).

The optional potentiometer at Pin 26 allows an offset compensation of the VCO phase for improved sound quality (fine adjustment). Without a potentiometer (open circuit at Pin 26). this offset compensation is not active.

The oscillator signal passes a phase shifter and supplies the in-phase signal (0°) and the quadrature signal (90°)of the generated picture carrier.

Video Demodulation and Amplifier

The video IF signal, which is applied from the gain controlled IF amplifier, is multiplied with the inphase component of the VCO signal. The video demodulator is designed for low distortion and large bandwidth. The demodulator output signal passes an integrated low pass filter for attenuation of the residual vision carrier and is fed to the video amplifier. The video amplifier is realized by an operational amplifier with internal feedback and 8 MHz bandwidth (-3 dB). A standard dependent de level shift in this stage delivers the same sync. level for positive and negative modulation. An additional noise clipping is provided. The video signal is fed to VIF-AGC and to the video output buffer. This amplifier with a 6 dB gain offers easy adaption of the sound trap. For nominal video IF modulation the video output signal at Pin 12 is 2 V_{pp}.

Sound IF Amplifier and SIF-AGC

The SIF amplifier is nearly identical with the 3-stage VIF amplifier. Only the first amplifier stage exists twice and is switchable by a control voltage at Pin 3. Therefore with a minimal external expense it is possible to switch between two different SAW filters. Both SIF inputs features ex-

cellent cross-talk attenuation and an input impedance which is independent from the switching condition.

The SIF-AGC is related to the average level of AM- or FM-carrier and controls the SIF amplifier to provide a constant SIF signal to the AM demodulator and QPS mixer.

AM Demodulator

The alignment-free AM demodulator is realized by a synchronous detector. The modulated SIF signal from the SIF amplifier output is multiplied in phase with the limited SIF signal (AM is removed). The AF signal of the demodulator output is fed to the output amplifier and to the SIF-AGC. For all TV standards with negative video modulation (eg., B/G standard). the AF output signal (Pin 25) is switched off by the standard switch.

Quasi-Parallel-Sound (QPS) Mixer

The QPS mixer i~ realized by a multiplier. The signal (FM or NICAM carrier) is converted to the intercarrier frequency by the regenerated picture carrier frequency by the regenerated picture carrier (quadrature signal) which is provided from the VCO. The intercarrier signal is fed via an output amplifier to Pin 24.

Standard Switch

To have equal polarity of the video output signal the polarity can be switched in the demodulation stage in accordance with the TV standard. Additional a standard dependent de level shift in the video amplifier delivers the same sync. level. In parallel to this, the correct VIF-AGC is selected for positive or negative modulated VIF signals. In the case of negative modulation (e.g., B/G standard) the AM output signal is switched off. For positive modulation (L standard) the AM demodulator and QPS mixer is active. This condition allows a parallel operation of the AM sound signal and the NICAM-L stereo sound.

L'Switch

With a control voltage at Pin 14 the VCO frequency can be switched for setting to the required L' value (L' standard). Also a fine adjustment of the L'-VCO center frequency is possible via a potentiometer. The L' switch is only active for positive modulated video IF-signals (standard switch in L mode).

AFC Switch

The AFC output signal at Pin 22 can be controlled by a switching voltage at Pin 19. It is possible to select an AFC output signal with a rising-or falling AFC curve and to switch off the AFC.

VCR Mode

For the VCR mode in a TV set (external video source selected), it is recommendable to switch off the IF circuit. With an external switching voltage at Pin 6 or 7, the IF amplifiers are switched off and all signal output levels at Pins 12, 24, and 25 are according to the internal de voltage.

Internal Voltage Stabilizer

The internal bandgap reference ensures constant performance independent of supply voltage and temperature.

ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	VALUE	Unit
Supply voltage	Pin23			
SDIP28 package		v_S	9.0	V
SO28 package		v_S	6.0	V
Supply current	Pin23	I_S	93	mA
Power dissipation	SDIP28 package	P	840	mW
	SO28 package	P	560	mW
Output currents	Pins 12. 24 and 25	I_{out}	5	mA
External voltages				
Pins1, 2, 5 to 8, 10, 12, 14, 17, 18 and 24 to 28V		V_{ext}	+4.5	V
Pins 15, 20 and 21			+3.5	V
Pin 11			+13.5	V
Pins 3, 13, 19 and 22			V_S	V
Junction temperature		Tj	+125	°C
Storage temperature		Tstg	-25 to +125	°C
Electrostatic handling *) all pins		V_{ESD}	±300	V

*) Equivalent to dischanging a 200 pF capacitor trough a 0 Ω resistor.

OPERATING RANGE

PARAMETER		SYMBOL	VALUE	Unit
Supply voltage range	Pin23			
SDIP28 package		v_S	4.5 to 9.0	V
SO28 package		v_S	4.5 to 6.0	V
Ambient temperature		Tamb	-10 to + 85	°C

THERMAL RESISTANCE

PARAMETER	SYMBOL	VALUE	Unit
Junction ambient, when soldered to PCB			
SDIP28 package	RthJA	55	K/W
SO28 package	RthJA	75	K/W

ELECTRICAL CHARACTERISTICS

V_S = +5V, T_{amb} = +25°C; reference point Pin 4 (9, 16), unless otherwise specified

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
DC-supply	Pin 23					
Supply voltage - SDIP28		v_s	4.5	5.0	9.0	V
- SO28		v_s	4.5	5.0	5.5	V
Supply current		I_s		85	93	mA
VIF-input	Pin 6, 7					
Input sensitivity, (RMS value)	For FPLL locked	V_{in}		80	120	μV_{RMS}
Input impedance	See note 1	R_{in}		1.2		kΩ
Input capacidance	See note 1	C_{in}		2		pF
VIF-AGC	Pins 8 and 15					
IF gain control range		G_V	60	65		dB
AGC capacitor	Pin 8	C_{AGC}		2.2		µF
Black Level capacitor	Pin 15	C_{BL}		100		nF
Switching voltage: VCR mode	See note 2	V_{sw}		4.0		V
Switching current: VCR mode	See note 2	I_{sw}		50		µA
Tuner-AGC	Pins 10 and 11 see note 3					
Available tuner - AGC current		I_{tun}	1	2	4	mA
Allowable output voltage		V11	0.3		13.5	V
IF slip - tuner AGC	Current I_{tun}: 10 to 90%	DG_{IF}		8	10	dB
IF input signal for minimum take over point	R_{top} = 10 kΩ (V_{top} = 4.5V)	V_{in}			4	mV
IF input signal for maximum take over point	R_{top} = 0(V_{top} = 0.8V)	V_{in}	40			mV
Variation of the take over point by temperature	DT_{amb} = 55 °C VIF - AGC; G_V = 46 dB	DV_{in}		2	3	dB
FPLL and VCO	Pins 18, 20, 21 and 26 see note 4					
Max. oscillator frequency	For carrier generation	f_{vco}	70			MHz
Vision carrier capture range	f_{vco} = 38.9MHz C_{vco} = 8.2pF	Df_{cap}	±1.5	±2		MHz
Oscillator drift (free running) as function of temperature	See note 5, DT_{amb} = 55 °C C_{vco} = 8.2pF f_{vco} = 38.9MHz	$Df/_{DT}$			-0.3	%
Video Output	Pin 12					
Output current - source		$\pm I_{12}$			5	mA
- sink			2		3	mA
Output resistance	See note 1	R_{out}			100	Ω
Video output signal	Peak-to-peak value	$V_{o,vid}$	1.8	2.0	2.2	V_{pp}
Difference of the video signals	Between B/G and L	$DV_{o,vid}$			10	%
Sync. level		V_{sync}		1.2		V
Zero carrier level for neg. modulation, ultra white level	$V_{13} = V_s$ V_8 = 3V	VDC		3.4		V
Zero carrier level for pos. modulation, ultra black level	V_{13} = 0 V_8 = 3V	VDC		1.15		V
Supply voltage influence on the ultra white and ultra black level		$DV/_V$		1		%/V
Video bandwith (–3 dB)	$R_L \geq 1k\Omega$, $C_L \leq 50$ pF	B	6	8		MHz

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Video frequency response over the AGC range		ΔB			2.0	dB
Diffrential gain error		DG		2	5	%
Diffrential phase error		DP		2	5	deg
Intermodulation 1.07 MHz	See note 6	a_{IM}	52	60		dB
Video signal to noise ratio	Weighted, CCIR-567	$S/_N$	56	60		dB
Residual vision carrier fundamental wave 38.9 MHz and second harmonic 77.8 MHz		Vres1		2	10	mV
Lower limiting level	Below sync level	ΔV_{lim1}		400		mV
Upper limiting level	Above ultra white level	ΔV_{lim2}		600		mV
Ripple rejection	See note 1, Pin 23/Pin 12	RR	35			dB
Standard switch	Pin 13					
Control voltage for mode 1: neg. modulated video-IF signals and AM/NICAM sound	See note 7	v_{sw}	2.0		V_S	V
Control voltage for mode 2: pos. modulated video-IF signals and AM/L-NICAM sound		v_{sw}	0		0.8	V
Switching current		I_{sw}		±100		µA
AFC output	Pin 22					
Control slope		$DI/_{Df}$		0.7		µA/kHz
Frequency drift by temperature	Related to the picture carrier frequency			0.25	0.6	%
Output voltage upper limit lower limit		v_{AFC}	 v_S-0.4		 0.4	 V V
Output current		I_{AFC}		±0.2		mA
AFC switch	Pin 19					
Control voltage: AFC “off” AFC curve rising AFC curve falling	 See note 8	V_{sw}	0 1.5 3.5		0.8 2.5 V_S	V V V
Switching current		I_{sw}		±100		µA
L’ switch	Pin 14					
Control voltage: L’ frequency + L’-VCO alignment		V_{sw}	0		3.0	V
L standard	See note 9		3.4		V_S	V
Switching current	V_{sw} = 0	I_{sw}		700		µA
SIF-input	Pin 1-2, 27-28					
Input sensitivity,	Output signal	V_{in}		80	120	μV_{RMS}
(RMS value)	at Pin 24/25: -3 dB					
Input impedance	See note 1	R_{in}		1.2		kΩ
Input capacidance	See note 1	C_{in}		2		pF
SIF-AGC	Pin 5					
IF gain control range		G_V	60	65		dB
AGC capacitor		C_{AGC}		10		µF
Intercarrier output - FM	Pin 24 see note 10					
DC output voltage		V_{DC}		2		V

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Output resistance	See note 1	R_{out}		150		Ω
Sound IF output voltage (5.5 MHz output voltage)	v_{in} = 10 mV	V_{out}	180	250	350	mV_{RMS}
Weighted signal to noise ratio: (CCIR 468)	Ref. signal: v_{in} = 10 mV; FM dev. = ±27 kHz fmod = 1 kHz; tested with the double FM demod. U2860B; B/G modulated VIF signal					
	Black screen: Channel 1/2	S/N		60/58		dB
	Grid pattern: Channel 1/2	S/N		54/52		dB
	Gray screen 50%: Channel 1/2	S/N		60/57		dB
Ripple rejection	See note 1, Pin 23/Pin 24	RR	35			dB
AF output-AM	PİN 25 see note 11					
DC output voltage		V_{DC}		2.2		V
Output resistance	See note 1	R_{out}		150		Ω
AF output voltage		V_{0AF}	400	500	630	mV_{RMS}
Total harmonic distortion	m= 54% fmod= 1 kHz and 12.5 kHz	THD		1	2	%
Signal to noise ratio	Reference: m=54% f_{mod} = 1 kHz, 22 kHz low pass filter	S/N		65		dB
Ripple rejection	See note 1, Pin 23/Pin 25	RR	28			dB
SIF input selector switch	Pin 3					
Control voltage						
input 1 active	See note 12	V_{sw}	2.0		VS	V
input 2 active			0		0.8	V
Switching current		I_{sw}		±100		µA

Notes

1) This parameter is given as an application information and not tested during production.
2) In VCR mode the VIF- and SIF path is switched off.
3) Adjustment of turn over point (delayed tuner AGC) with external resistor R_{top} or external voltage V_{top} possible.
4) Resonance circuit of VCO (f_o = 38.9 MHz): C_{vco} = 8.2 - 10 pF,
   Coil L_{VCO} with unloaded Q-factor $Q_o \geq 60$ for an oscillator voltage ≥ 100 mV_{RMS} at Pin 20 - 21 (e.g. TOKO coil 7 KM, 292 XNS - 4051Z)
5) The oscillator drift is related to the picture carrier frequency, at external temperature-compensated LC circuit.
6) a (1.07)= 20 log (4.43 MHz component/1.07 MHz component); a (1.07) value related to black-white signal input signal conditions: picture carrier = 0 dB, colour carrier = -6 dB, sound carrier = -24 dB
7) Without external control at Pin 13 the IC automatically operates in mode 1:
   fi negative modulated video-IF signals and FM/NICAM sound signals.
8) Without control voltage at Pin 19 falling AFC curve is automatically selected.
9) With open circuit at Pin 14 the L' switch is not active.
10) Picture carrier PC = 38.9 MHz; sound carrier SC_1 = 33.4 MHz, SC_2 = 33.16 MHz;
    PC/SC_1 =13 dB; PC/SC_2 = 20 dB; PC unmodulated (equivalent to sync. peak level).
11) Sound carrier SC = 32.4 MHz, modulated with f_{mod} = 1 kHZ, m = 54%; v_{in}, =10 mV
12) Without control voltage at Pin 3 the SIF input 1 is automatically selected.

PCF85xx (PCF8598)

EEPROM

FEATURES

- Low power CMOS:
  - maximum operating current:
  2.0 mA (PCF8582C-2)
  2.0 mA (PCF8594C-2)
  4.0 mA (PCF8598C-2)
  - maximum standby current 10 µA (at 6.0 V), typical 4 µA
- Non-volatile storage of:
  - 8 kbits organized as 1024 X 8-bit (PCF8598C-2)
- Single supply with full operation down to 2.5 V
- On-chip voltage multiplier
- Serial input/output I²C-bus
- Write operations:
  - byte write mode
  - 8-byte page write mode (minimizes total write time per byte)
- Read operations:
  - sequential read
  - random read
- Internal timer for writing (no external components)
- Power-on-reset
- High reliability by using a redundant storage code
- Endurance: 1 000 000 Erase/Write (E/W) cycles at T_{amb}= 22°C
- 10 years non-volatile data retention time
- Pin and address compatible to: PCF8570, PCF8571, PCF8572 and PCF8581.

GENERAL DESCRIPTION

The PCF85xxC-2 is a family of floating gate Electrically Erasable Programmable Read Only Memories (EEPROMs) with 2, 4 and 8 kbits (256,512 and 1024 x 8 bit). By using an internal redundant storage code it is fault tolerant to single bit errors. This feature dramatically increases the reliability compared to conventional EEPROMs. Power consumption il low due to the full CMOS technology used. The programming voltage is generated on-chip, using a voltage multiplier.

As data bytes are received and transmitted via the serial I²C-bus, a package using eight pins is sufficient. Up to eight PCF85xxC-2 devices may be connected to the I²C-bus. Chip select is accomplished by three address inputs (A0, A1 and A2).

Timing of the E/W cycle is carried out internally, thus no external components are required. Pin 7 (PTC) must be connected to either V_{DD} or left oper-Circuit. There is an option of using an external clock for-timing the length of an E/W cycle.

QUICK REFERENCE DATA

Symbol	Parameter	Conditions	Min	Max.	Unit
V_{DD}	Supply voltage		2.5	6.0	V
I_{DDR}	Supply current read	f_{SCL} = 100kHz			
		V_{DD} = 2.5V	–	60	µA
		V_{DD} = 6V	–	200	µA
I_{DDW}	Supply current E/W	f_{SCL} = 100kHz			
	PCF8582C-2	V_{DD} = 2.5V	–	0.6	mA
		V_{DD} = 6V	–	2.0	mA
	PCF8594C-2	V_{DD} = 2.5V	–	0.8	mA
		V_{DD} = 6V	–	2.5	mA
	PCF8598C-2	V_{DD} = 2.5V	–	1.0	mA
		V_{DD} = 6V	–	4.0	mA
$I_{DD(stb)}$	standby supply current	V_{DD} = 2.5V	–	3.5	µA
		V_{DD} = 6V	–	10	µA

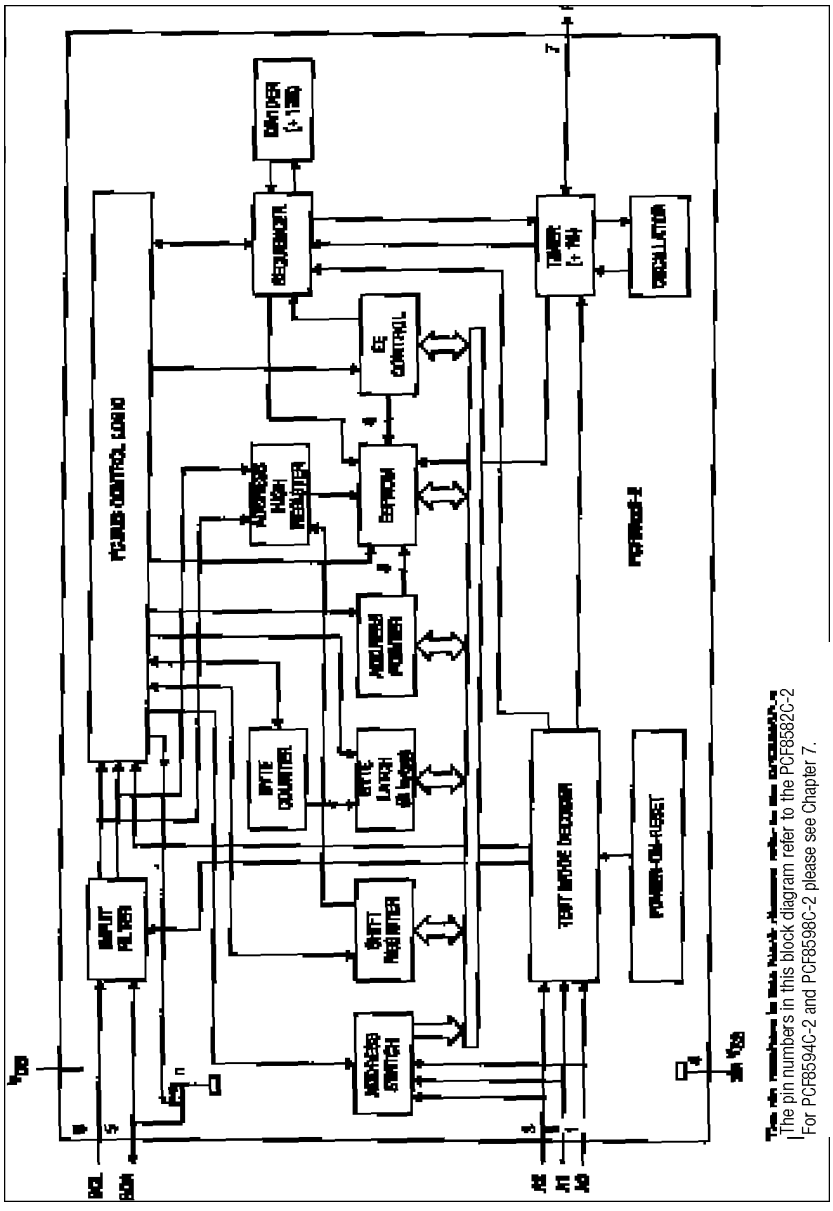
ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PCF8582C-2P	DIP-8	plastic dual in-line package; 8 leads (300 mil)	SOT-97-1
PCF8594C-2P			
PCF8598C-2P			
PCF8582C-2T	SO-8	plastic small outline package; 8 leads (straight); body width 3.9 mm	SOT-96-1
PCF8594C-2T			
PCF8598C-2T	SO-8	plastic small outline package; 8 leads; body width 7.5 mm	SOT-176-1

DEVICE SELECTION

Table 1 Device selection code

SELECTION	DEVICE CODE				CHIP ENABLE			R/$\overline{W}$
Bit	b7(1)	b6	b5	b4	b3	b2	b1	b0
Device	1	0	1	0	A2	A1	A0	R/$\overline{W}$



PINNING

Pin description PCF8598C-2.

SYMBOL	PIN	DESCRIPTION
WP	1	write-protection input
n.c.	2	not connected
A2	3	address input 2
V_{SS}	4	negative supply voltage
SDA	5	serial data input/output (I^2C-bus)
SCL	6	serial clock input (I^2C-bus)
PTC	7	programming time control output
V_{DD}	8	positive supply voltage

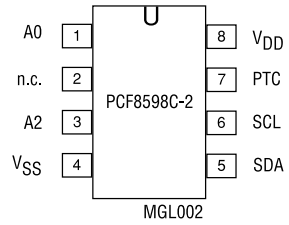


Fig.4 Pin configuration PCF8598C-2.

I^2C-BUS PROTOCOL

The I2C-bus is for 2-way, 2-line communication between different ICs or modules. The serial bus consists of two bidirectional lines: one for data signals (SDA), and one for clock signals (SCL).

Both the SDA and SCL lines must be connected to a positive supply voltage via a pull-up resistor.

The following protocol has been defined:

• Data transfer may be initiated only when the bus is not busy.

• During data transfer, the data line must remain stable whenever the clock line is HIGH. Changes in the data line while the clock line is HIGH will be interpreted as control signals.

Bus conditions

The following bus conditions have been defined:

• Bus not busy: both data and clock lines remain HIGH.

• Start data transfer: a change in the state of the data line, from HIGH-to-LOW, while the clock is HIGH, defines the START condition.

• Stop data transfer: a change in the state of the data line, from LOW-to-HIGH, while the clock is HIGH, defines the STOP condition.

• Data valid: the state of the data line represents valid data when, after a START condition, the data line is stable for the duration of the HIGH period of the clock signal. There is one clock pulse per bit of data.

Data transfer

Each data transfer is initiated with a START condition and terminated with a STOP condition. The number of the data bytes, transferred between the START and STOP conditions is limited to 7 bytes in the E/W mode and 8 bytes in the page E/W mode.

Data transfer is unlimited in the read mode.

The information is transmitted in bytes and each receiver acknowledges with a ninth bit.

Within the I^2C-bus specifications a low-speed mode(2 kHz clock rate) and a high speed mode (100 kHz clock rate) are defined. The PCF85xxC-2 operates in both modes.

By definition a device that sends a signal is called a 'transmitter', and the device which receives the signal is called a 'receiver'. The device which controls the signal is called the 'master'. The devices that are controlled by the master are called 'slaves'.

Each byte is followed by one acknowledge bit. This acknowledge bit is a HIGH level, put on the bus by the transmitter. The master generates an extra acknowledge related clock pulse. The slave receiver which is addressed is obliged to generate an acknowledge after the reception of each byte.

The master receiver must generate an acknowledge after the reception of each byte that has been clocked out of the slave transmitter.

The device that acknowledges has to pull down the SDA line during the acknowledge clock pulse in such a way that the SDA line is stable LOW during the HIGH period of the acknowledge related clock pulse.

Set-up and hold times must be taken into account.

A master receiver must signal an end of data to the slave transmitter by not generating an acknowledge on the last byte that has been clocked out of the slave. In this event the transmitter must leave the data line HIGH to enable the master generation of the STOP condition.

TDA3653B

Vertical Deflection Circuit

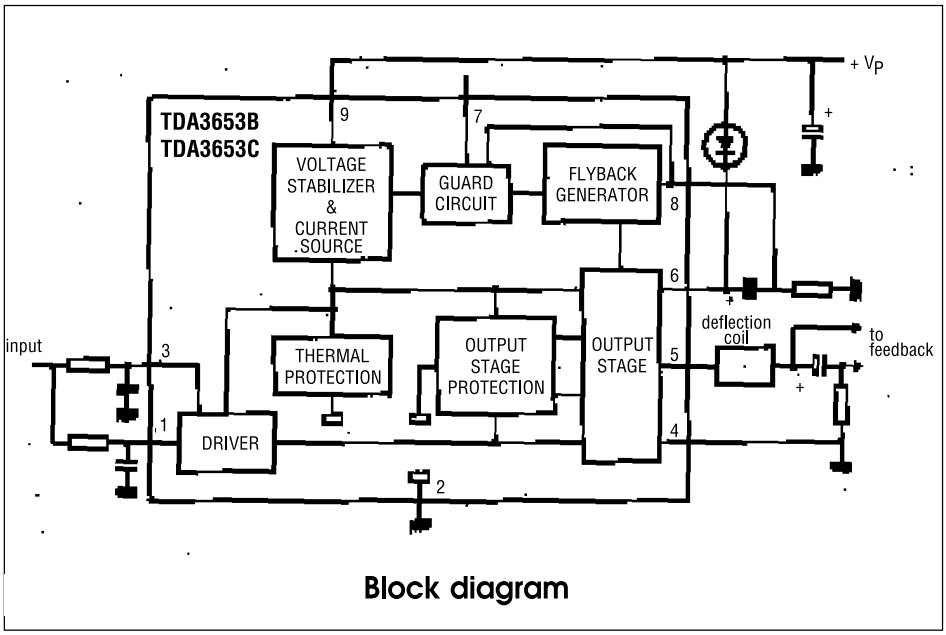
The TDA3653B is a vertical deflection output circuit for drive of various deflection systems with current up to 1.5 A peak to peak.

FEATURES

- Driver
- Output Stage
- Thermal Protection
- Flyback Generator
- Voltage Stabilizer
- Guard Circuit

TDA 3653B

PINNING		PIN VOLTAGE
1	Output Stage Driver Input	1.2V and 2Vpp
2	Ground	-
3	Switching Circuit Input	1.2V and 2Vpp
4	Output Stage Ground	-
5	Output Voltage	13V and 45Vpp
6	Supply Voltage for the Output Stage	26V
7	DC Voltage produced by the Guard Circuit	-
8	Flyback Generator Output	8V
9	Supply Voltage	26V



Block diagram

TDA6103Q

Video Output Amplifier

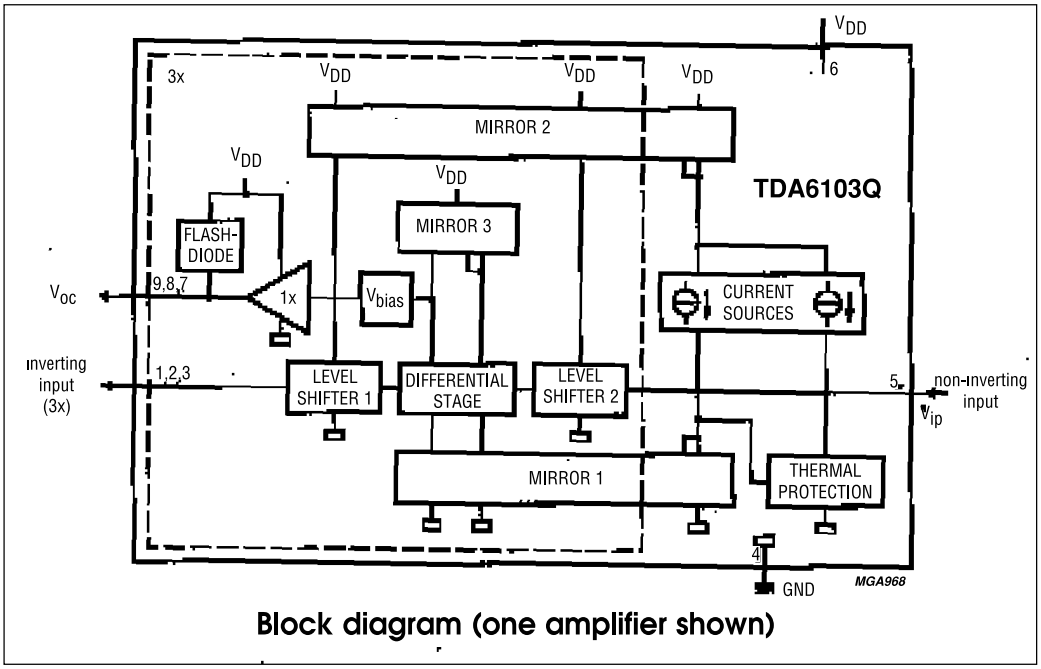
On CRT Board, TDA 6103Q is used as video output amplifier. The TDA 6103Q includes three video output amplifier intended to drive the three cathodes of color CRT.

FEATURES

- High Bandwith : 7.5 Mhz typical
- High slew rate : 1600 V/us
- Simple application with a variety of color decoders
- Only one supply voltage needed
- Internal protection against positive appearing CRT flashover discharges
- One non-inverting input with a low minimum input voltage of 1V
- Thermal protection
- Controllable switch-off behavior

TDA 6103Q

PINNING		PIN VOLTAGE
1	Inverting input 1	:1.0Vpp
2	Inverting input 2	:1.0Vpp
3	Inverting input 3	:1.0Vpp
4	Ground, fin	: -
5	Non-inverting input	:1.8V
6	Supply voltage	:180V
7	Cathode output 3	: 90Vpp



Block diagram (one amplifier shown)

POWER MOS AND HORIZONTAL DRIVE TRANSISTORS SPECS

STH3N90 / STP3N90FI

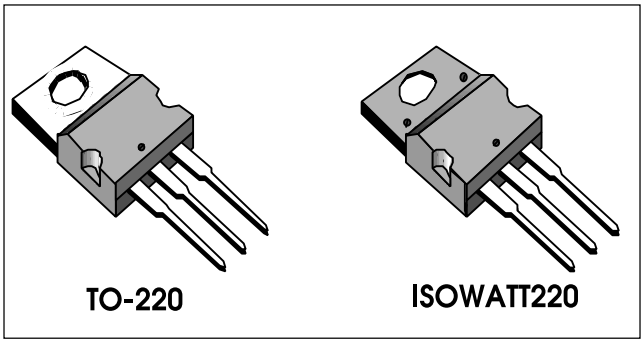
N-CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH5N90	900 V	< 2.4 Ω	5.3 A
STH5N90FI	900 V	< 2.4 Ω	3.5 A

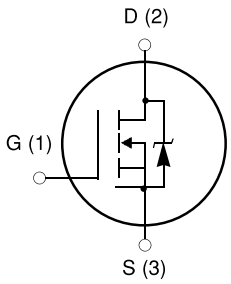
- Typical $R_{DS(on)}$ = 3.9 Ω
- Avalanche Rugged technology
- 100% avalanche tested
- Repetitive avalanche data at 100°C
- Low input capacitance
- Low gate charge
- Application oriented characterization

APPLICATIONS

- High current, high speed switching
- Switch mode power supplies (SMPS)
- Consumer and industrial lighting
- DC-AC inverters for welding equipment and uninterruptible power supply (UPS)



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH3N90	STH3N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.2	1.9	A
I_D	Drain Current (continuous) at T_c = 100 °C	2	1.2	A
I_{DM} (•)	Drain Current (pulsed)	13	13	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	-	2000	V
Tstg	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) *Pulse width limited by safe operating area*

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, d < 1%)	3.2	A
E_{AS}	Single Pulse Avalanche Energy (starting Tj = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, d < 1%)	4.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, d < 1%)	2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.7 A V_{GS} = 10V I_D = 1.7 A T_c = 100 °C		3.9	4.5 9	W W
$I_{D(on)}$	On State Drain Current	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$ VGS = 10 V	3.2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$ I_D = 1.7 A	1	3.5		S
C_{iss}	Input Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		650	850	pF
C_{oss}	Output Capacitance			82	105	pF
C_{rss}	Reverse Transfer Capacitance			28	40	pF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 30 V I_D =2.1 A			50	ns
t_r	Rise Time	R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		85	105	ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170		A/µs
Q_g	Total Gate Charge V_{GS} = 10 V	V_{DD} = 400V I_D = 3 A	42	55	nC	
Q_{gs}	Gate-Source Charge			6		nC
Q_{gd}	Gate-Drain Charge			17		nC

SWITCHING OFF

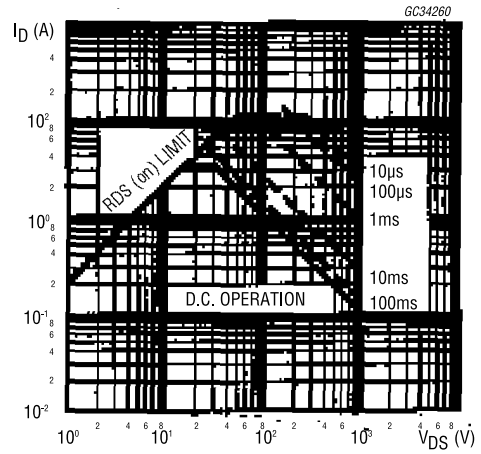
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 640 V I_D = 3 A		95	120	ns
t_f	Fall Time	R_G = 50 Ω V_{GS} = 10 V		20	25	ns
t_c	Cross-over Time	(see test circuit, figure 5)		120	165	ns

SOURCE DRAIN DIODE

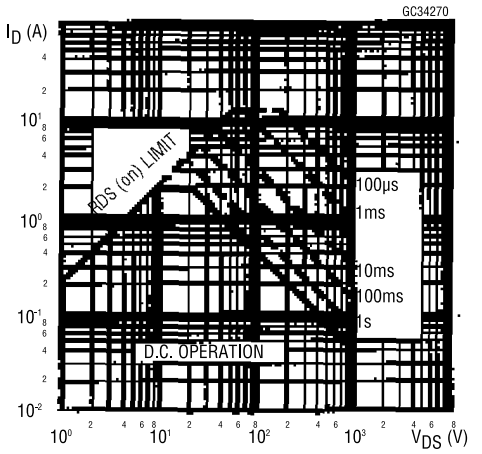
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				3.2	A
I_{SDM} (•)	Source-drain Current (pulsed)				1.3	A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3.2 A V_{GS} = 0			2	V
t_{rr}	Reverse Recovery Time	I_{SD} =3 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150°C		700		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, figure 5)		8.8		µC
I_{RRM}	Reverse Recovery Current			25		A

(*) *Pulsed: Pulse duration = 300 µs, duty cycle 15% (•) Pulse width limited by safe operating area*

Safe Operating Areas For TO-218



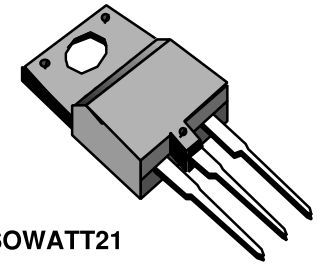
Safe Operating Areas For ISOWATT218



BUH515D

CRT HORIZONTAL DEFLECTION HIGH VOLTAGE NPN FASTSWITCHING TRANSISTOR

- High breakdown voltage capability
- Fully insulated package for easy mounting
- Low saturation voltage
- High switching speed
- Complete characterization of power losses and switching times as a function of negative base current for optimum drive

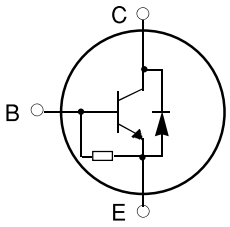


ISOWATT21

APPLICATIONS:

- Horizontal deflection stage in standard and high resolution dis-plays for TV's and monitors

INTERNAL SCEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CB0}	Collector-Base Voltage (I_E = 0)	1500	V
V_{CE0}	Collector-Emitter Voltage (I_B = 0)	700	V
V_{EB0}	Emitter-Base Voltage (I_c = 0)	5	V
I_C	Collector Current	8	A
I_{CM}	Collector Peak Current (t_p < 5 ms)	15	A
I_B	Base Current	5	A
I_{BM}	Base Peak Current (t_p < 5 ms)	8	A
P_{tot}	Total Dissipation at Tc = 25°C	60	W
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

THERMAL DATA

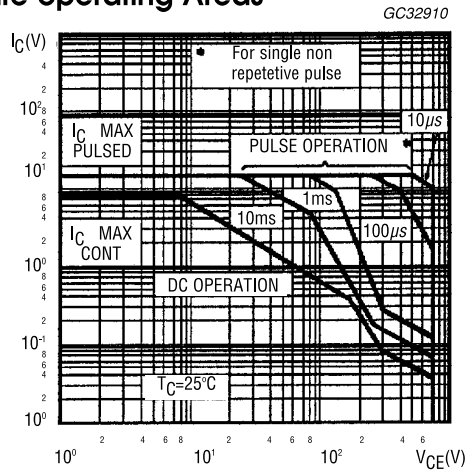
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	ºC/W

ELECTRICAL CHARACTERISTICS (Tcase = 25°C unless otherwise specified)

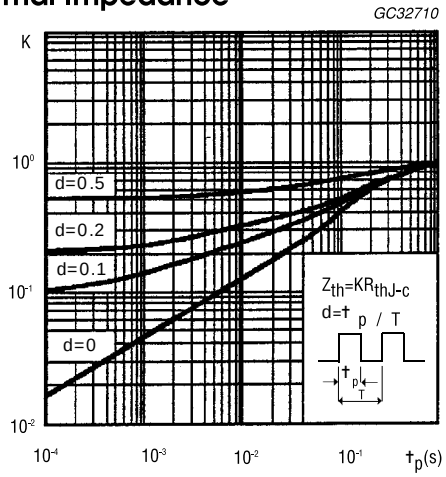
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current (V_{BE} = 0)	V_{CE} = 1500 V V_{CE} = 1500 V T_j = 125°C			1 2	mA mA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			300	mA
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 5 A I_B = 1.25 A			1.5	V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 5 A I_B = 1.25 A			1.3	V
h_{FE}*	DC Current Gain	I_c = 5 A V_{CE} = 5 V I_c = 5 A V_{CE} = 5 V T_J= 100 °C	5 3			
t_s t_f	RESISTIVE LOAD Storage Time Fall Time	Vcc = 400 V I_C = 5 A I_{B1} = 1.25 A I_{B2} = 2.5 A		2.4 170	3.6 260	µs ns
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	I_c = 5 A f = 15625 Hz I_{B1} = 1.25 A I_{B2} = 2.5 A $V_{ceflyback} = 1050 \sin \left\{ \frac{p}{10} 10^6 \right\} t$ V		3.5 4.50		µs ns
V_f	Diode Forward Voltage	I_F = 5 A			2	V

* *Pulsed: Pulse duration = 300 µs, duty cycle 1.5%*

Safe operating Areas



Thermal Impedance



CHASSIS REPLACEMENT PART LIST

PART NO	COMPONENT	POS
002032000001	CABLE 3P*2SKT 24CM W/SHIELDING	
002041100050	CABLE 4P*1SKT 50/50CM DBL.ISLT	
002042000031	CABLE 4P(3P)*2SKT.39CM CRT	
002052000401	CABLE 5P*2SKT.40CM	
002094513550	CABLE 3P*1SKT 45CM PREAMP.LUMA	
002344500021	CABLE 2P*1SKT.40CM VRT BRN/BLK	
002344500031	CABLE 2P*1SKT.40CM HORZ.RED/WH	
002528554031	CABLE POWER 220CM 2*500UH	
002720517070	CABLE 24*0.20*40MM	
005000000120	HOLDER VIDEO AUDIO KULAKLIK	
005010021810	HOLDER POWER CABLE 20/21/28CROMA	
005010021920	HOLDER STEREO BISO-MONITOR PT	
005020011250	HAND CUFFS KLTLI.SMALL WHITE	
005051084620	SILICONE RUB.INS. TO220 13X23	I003
005051084631	BEAD INSH:2.5D3XD3.5H:2D3XD6.2	I003
005112000150	BUTTON ON-OFF 20/21 NOVA	2DYM
005118142280	BUTTON 4'KEYS 20/21 NOVA	2DY4
005410023830	HOLDER ANOT CABLE	
005415031240	STICKER HOTLINE SERVICE TEVION5530	
005420011700	HOLDER CABLE SMALL BLACK	
005455002150	HOLDER CABLE	
013466062930	LOGO TEVION	
030010627421	RESISTOR M.O 270K 1W 5%	R004
030020610331	RESISTOR C.F 10K 1/4W 5%	R032
030020622131	RESISTOR C.F 220R 1/4W 5%	R035
030020622131	RESISTOR C.F 220R 1/4W 5%	R364
030020647131	RESISTOR C.F 470R 1/4W 5%	R625
030020647231	RESISTOR C.F 4.7K 1/4W 5%	R608
030020656131	RESISTOR C.F 560R 1/4W 5%	R499
030050615211	RESISTOR C.F 1.5K 1/2W 5%	R214
030050615211	RESISTOR C.F 1.5K 1/2W 5%	R215
030050615211	RESISTOR C.F 1.5K 1/2W 5%	R216
030050615901	RESISTOR M.O 1.5R 1/2W 5%	R624
030050647111	RESISTOR C.F 470R 1/2W 5%	R626
030050647511	RESISTOR C.F 4.7M 1/2W 5% SFTY	R013
030050682321	RESISTOR C.F 82K 1/2W 5%	R208
030050682321	RESISTOR C.F 82K 1/2W 5%	R209
030050682321	RESISTOR C.F 82K 1/2W 5%	R210
030055722811	RESISTOR FUSIBLE 0.22R 1/2W 5%	R611
030059622111	RESISTOR M.O 220R1/2W 5%NONFLM	R627
030100639101	RESISTOR FUSIBLE 39R 1/4W 5%	R213
030105622811	RESISTOR FUSIBLE 0.22R 1W 5%	R647
030108100611	RESISTOR M.O 1M 1/6W 5%	R142
030108150611	RESISTOR M.O 1.5M 1/6W 5%	R141
030108647311	RESISTOR M.O 47K 1W 5%	R024
030108668411	RESISTOR M.O 680K 1W 5%	R005

PART NO	COMPONENT	POS
030108712311	RESISTOR M.O 12K 1W 5%	R025
030140610101	RESISTOR C.F 100R 1/6W 5%	R903
030140610101	RESISTOR C.F 100R 1/6W 5%	R904
030140610101	RESISTOR C.F 100R 1/6W 5%	R911
030140610101	RESISTOR C.F 100R 1/6W 5%	R912
030140610101	RESISTOR C.F 100R 1/6W 5%	R956
030140610101	RESISTOR C.F 100R 1/6W 5%	R961
030140610101	RESISTOR C.F 100R 1/6W 5%	R104
030140610101	RESISTOR C.F 100R 1/6W 5%	R106
030140610101	RESISTOR C.F 100R 1/6W 5%	R121
030140610101	RESISTOR C.F 100R 1/6W 5%	R122
030140610101	RESISTOR C.F 100R 1/6W 5%	R123
030140610101	RESISTOR C.F 100R 1/6W 5%	R303
030140610101	RESISTOR C.F 100R 1/6W 5%	R338
030140610101	RESISTOR C.F 100R 1/6W 5%	R339
030140610101	RESISTOR C.F 100R 1/6W 5%	R340
030140610101	RESISTOR C.F 100R 1/6W 5%	R343
030140610101	RESISTOR C.F 100R 1/6W 5%	R344
030140610101	RESISTOR C.F 100R 1/6W 5%	R358
030140610201	RESISTOR C.F 1K 1/6W 5%	R900
030140610201	RESISTOR C.F 1K 1/6W 5%	R952
030140610201	RESISTOR C.F 1K 1/6W 5%	R964
030140610201	RESISTOR C.F 1K 1/6W 5%	R103
030140610201	RESISTOR C.F 1K 1/6W 5%	R111
030140610201	RESISTOR C.F 1K 1/6W 5%	R117
030140610201	RESISTOR C.F 1K 1/6W 5%	R120
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030140610201	RESISTOR C.F 1K 1/6W 5%	R362
030140610201	RESISTOR C.F 1K 1/6W 5%	R495
030140610201	RESISTOR C.F 1K 1/6W 5%	R636
030140610201	RESISTOR C.F 1K 1/6W 5%	R652
030140610201	RESISTOR C.F 1K 1/6W 5%	R203
030140610201	RESISTOR C.F 1K 1/6W 5%	R205
030140610201	RESISTOR C.F 1K 1/6W 5%	R207
030140610311	RESISTOR C.F 10K 1/6W 5%	R905
030140610311	RESISTOR C.F 10K 1/6W 5%	R955
030140610311	RESISTOR C.F 10K 1/6W 5%	R963
030140610311	RESISTOR C.F 10K 1/6W 5%	R011
030140610311	RESISTOR C.F 10K 1/6W 5%	R030
030140610311	RESISTOR C.F 10K 1/6W 5%	R136

PART NO	COMPONENT	POS
030140610311	RESISTOR C.F 10K 1/6W 5%	R152
030140610311	RESISTOR C.F 10K 1/6W 5%	R153
030140610311	RESISTOR C.F 10K 1/6W 5%	R251
030140610311	RESISTOR C.F 10K 1/6W 5%	R310
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030140610311	RESISTOR C.F 10K 1/6W 5%	R329
030140610311	RESISTOR C.F 10K 1/6W 5%	R330
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030140610311	RESISTOR C.F 10K 1/6W 5%	R354
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030140610311	RESISTOR C.F 10K 1/6W 5%	R357
030140610311	RESISTOR C.F 10K 1/6W 5%	R359
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030140610311	RESISTOR C.F 10K 1/6W 5%	R621
030140610311	RESISTOR C.F 10K 1/6W 5%	R629
030140610411	RESISTOR C.F 100K 1/6W 5%	R127
030140610411	RESISTOR C.F 100K 1/6W 5%	R132
030140610411	RESISTOR C.F 100K 1/6W 5%	R143
030140610411	RESISTOR C.F 100K 1/6W 5%	R315
030140610411	RESISTOR C.F 100K 1/6W 5%	R360
030140610411	RESISTOR C.F 100K 1/6W 5%	R413
030140610411	RESISTOR C.F 100K 1/6W 5%	R663
030140610911	RESISTOR C.F 1R 1/6W5%NONFLMBL	R908
030140610911	RESISTOR C.F 1R 1/6W5%NONFLMBL	R915
030140612121	RESISTOR C.F 120R 1/6W 5%	R361
030140612211	RESISTOR C.F 1.2K 1/6W 5%	R659
030140612311	RESISTOR C.F 12K 1/6W 5%	R139
030140612311	RESISTOR C.F 12K 1/6W 5%	R390
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030140612311	RESISTOR C.F 12K 1/6W 5%	R662
030140612311	RESISTOR C.F 12K 1/6W 5%	R665
030140612311	RESISTOR C.F 12K 1/6W 5%	R666
030140612411	RESISTOR C.F 120K 1/6W 5%	R405
030140615211	RESISTOR C.F 1.5K 1/6W 5%	R220
030140615311	RESISTOR C.F 15K 1/6W 5%	R305
030140615311	RESISTOR C.F 15K 1/6W 5%	R311
030140615311	RESISTOR C.F 15K 1/6W 5%	R633
030140615311	RESISTOR C.F 15K 1/6W 5%	R217
030140618121	RESISTOR C.F 180R 1/6W 5%	R105
030140618201	RESISTOR C.F 1.8K 1/6W 5%	P604
030140618201	RESISTOR C.F 1.8K 1/6W 5%	R300
030140618201	RESISTOR C.F 1.8K 1/6W 5%	R312
030140618311	RESISTOR C.F 18K 1/6W 5%	R954
030140618311	RESISTOR C.F 18K 1/6W 5%	R962
030140622021	RESISTOR C.F 22R 1/6W 5%	R957

PART NO	COMPONENT	POS
030140622021	RESISTOR C.F 22R 1/6W 5%	R959
030140622101	RESISTOR C.F 220R 1/6W 5%	R006
030140622101	RESISTOR C.F 220R 1/6W 5%	R651
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R910
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R913
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R921
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R924
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R028
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R108
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R306
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R337
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R451
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R635
030140622221	RESISTOR C.F 2.2K 1/6W 5%	R212
030140622311	RESISTOR C.F 22K 1/6W 5%	R146
030140622311	RESISTOR C.F 22K 1/6W 5%	R346
030140622411	RESISTOR C.F 220K 1/6W 5%	R211
030140622511	RESISTOR C.F 2.2M 1/6W 5%	R308
030140622511	RESISTOR C.F 2.2M 1/6W 5%	R221
030140622901	RESISTOR C.F 2.2R 1/6W%5NONFLM	R958
030140622901	RESISTOR C.F 2.2R 1/6W%5NONFLM	R960
030140622901	RESISTOR C.F 2.2R 1/6W%5NONFLM	R154
030140624311	RESISTOR C.F 24K 1/6W 5%	R365
030140627211	RESISTOR C.F 2.7K 1/6W 5%	R953
030140627211	RESISTOR C.F 2.7K 1/6W 5%	R965
030140627211	RESISTOR C.F 2.7K 1/6W 5%	R347
030140627211	RESISTOR C.F 2.7K 1/6W 5%	R351
030140627211	RESISTOR C.F 2.7K 1/6W 5%	R366
030140627311	RESISTOR C.F 27K 1/6W 5%	R922
030140627421	RESISTOR C.F 270K 1/6W 5%	R950
030140627421	RESISTOR C.F 270K 1/6W 5%	R966
030140633101	RESISTOR C.F 330R 1/6W 5%	R349
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R302
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R335
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R341
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R342
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R370
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R371
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R372
030140633201	RESISTOR C.F 3.3K 1/6W 5%	R373
030140633301	RESISTOR C.F 33K 1/6W 5%	R325
030140633301	RESISTOR C.F 33K 1/6W 5%	R333
030140633511	RESISTOR M.F 3.3M 1/6W 5%	R140
030140639021	RESISTOR C.F 39R 1/2W 5%	R605
030140639111	RESISTOR C.F 390R 1/6W 5%	R027
030140639111	RESISTOR C.F 390R 1/6W 5%	R201

PART NO	COMPONENT	POS
030140639211	RESISTOR C.F 3.9K 1/6W 5%	R923
030140639211	RESISTOR C.F 3.9K 1/6W 5%	R620
030140639211	RESISTOR C.F 3.9K 1/6W 5%	R202
030140639211	RESISTOR C.F 3.9K 1/6W 5%	R204
030140639211	RESISTOR C.F 3.9K 1/6W 5%	R206
030140639301	RESISTOR C.F 39K 1/6W 5%	R317
030140639301	RESISTOR C.F 39K 1/6W 5%	R326
030140639301	RESISTOR C.F 39K 1/6W 5%	R613
030140642211	RESISTOR C.F 4.2K 1/6W 1%	R363
030140647011	RESISTOR C.F 47R 1/6W 5%	R008
030140647011	RESISTOR C.F 47R 1/6W 5%	R009
030140647111	RESISTOR C.F 470R 1/6W 5%	R101
030140647111	RESISTOR C.F 470R 1/6W 5%	R201
030140647111	RESISTOR C.F 470R 1/6W 5%	R202
030140647111	RESISTOR C.F 470R 1/6W 5%	R203
030140647211	RESISTOR C.F 4.7K 1/6W 5%	C951
030140647211	RESISTOR C.F 4.7K 1/6W 5%	C956
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R909
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R914
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R407
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R408
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R007
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R033
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R116
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R147
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R314
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R316
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R321
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R327
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R601
030140647211	RESISTOR C.F 4.7K 1/6W 5%	R673
030140647311	RESISTOR C.F 47K 1/6W 5%	R118
030140647311	RESISTOR C.F 47K 1/6W 5%	R151
030140647311	RESISTOR C.F 47K 1/6W 5%	R631
030140647411	RESISTOR C.F 470K 1/6W 5%	R138
030140647921	RESISTOR C.F 4.7R 1/6W5%NONFILM	R137
030140650911	RESISTOR C.F 5.1R 1/6W 5%	R010
030140656211	RESISTOR C.F 5.6K 1/6W 5%	R102
030140656211	RESISTOR C.F 5.6K 1/6W 5%	R144
030140656211	RESISTOR C.F 5.6K 1/6W 5%	R304
030140656211	RESISTOR C.F 5.6K 1/6W 5%	R367
030140656311	RESISTOR C.F 56K 1/6W 5%	R150
030140656311	RESISTOR C.F 56K 1/6W 5%	R318
030140656311	RESISTOR C.F 56K 1/6W 5%	R622
030140668121	RESISTOR C.F 680R 1/6W 5%	R309
030140668201	RESISTOR C.F 6.8K 1/6W 5%	R115

PART NO	COMPONENT	POS
030140668201	RESISTOR C.F 6.8K 1/6W 5%	R307
030140668411	RESISTOR C.F 680K 1/6W 5%	R951
030140668411	RESISTOR C.F 680K 1/6W 5%	R967
030140675011	RESISTOR C.F 75R 1/6W 5%	R637
030140675011	RESISTOR C.F 75R 1/6W 5%	R653
030140675011	RESISTOR C.F 75R 1/6W 5%	R654
030140675011	RESISTOR C.F 75R 1/6W 5%	R655
030140675011	RESISTOR C.F 75R 1/6W 5%	R656
030140675011	RESISTOR C.F 75R 1/6W 5%	R658
030140675201	RESISTOR C.F 7.5K 1/6W 5%	R012
030140682011	RESISTOR C.F 82R 1/6W 5%	R107
030140682011	RESISTOR C.F 82R 1/6W 5%	R602
030140682211	RESISTOR C.F 8.2K 1/6W 5%	R031
030140682211	RESISTOR C.F 8.2K 1/6W 5%	R612
030140682211	RESISTOR C.F 8.2K 1/6W 5%	R630
030208610311	RESISTOR M.O 10K 2W 5%	R604
030208668311	RESISTOR M.O 68K 2W 5%	R002
030218610211	RESISTOR M.O 1K 3W 5%	R609
030218610911	RESISTOR M.O 1R 3W 5%	R403
030308627311	RESISTOR M.O 27K 3W 5%	R003
032053620211	RESISTOR W.W 2K 5W 10%	R603
032053656921	RESISTOR W.W 5.6R 5W 10%	R001
032053656921	RESISTOR W.W 5.6R 5W 10%	R607
034710303681	THERM PTC 9R 30% 2P 10/2.5MM	RT01
037730007071	FILTER TRAP 5.5MHZ TPS5.5MB	F102
037730007961	FILTER SAW K2962M B/GD/K INTCR	F101
037730008211	FILTER CER 5.5MHZ SFE5.5MB	F104
037730008231	FILTER CER 5.74MHZ SFT5.74MA	F902
040030014031	CAP CER 10NF 50V 10% SH	C990
040030014031	CAP CER 10NF 50V 10% SH	C991
040032041001	CAP CER 10PF 50V 5% CH	C155
040032041001	CAP CER 10PF 50V 5% CH	C201
040032041001	CAP CER 10PF 50V 5% CH	C202
040032041001	CAP CER 10PF 50V 5% CH	C203
040032041801	CAP CER 18PF 50V 5% CH	C127
040032041801	CAP CER 18PF 50V 5% CH	C328
040032041801	CAP CER 18PF 50V 5% CH	C329
040032048301	CAP CER 8.2PF 50V+-0.5PF CH	C301
040034042701	CAP CER 27PF 50V 5% CH 05	C170
040034042701	CAP CER 27PF 50V 5% CH 05	C171
040040026861	CAP CER 6.8NF 2KV 10% B	C209
040040042211	CAP CER 220PF 50V 10% SL	C319
040040042211	CAP CER 220PF 50V 10% SL	C332
040040042231	CAP CER 2.2NF 50V 10% B	C651
040040042231	CAP CER 2.2NF 50V 10% B	C652
040040042231	CAP CER 2.2NF 50V 10% B	C653

PART NO	COMPONENT	POS
040040042231	CAP CER 2.2NF 50V 10% B	C654
040040042251	CAP CER 22NF 50V 10% B	C613
040040044701	CAP CER 47PF 50V 10% CH	C906
040040044701	CAP CER 47PF 50V 10% CH	C106
040040044701	CAP CER 47PF 50V 10% CH	C190
040040044721	CAP CER 4.7NF 50V 10% B	C135
040040044721	CAP CER 4.7NF 50V 10% B	C621
040040044721	CAP CER 4.7NF 50V 10% B	C622
040040141011	CAP CER 100PF 500V 10% B	C614
040040152211	CAP CER 2.2NF 1KV 10% BN	C003
040040152211	CAP CER 2.2NF 1KV 10% BN	C004
040040152211	CAP CER 2.2NF 1KV 10% BN	C603
040040154711	CAP CER 470PF 1KV 10% B	C008
040040154711	CAP CER 470PF 1KV 10% B	C015
040040154711	CAP CER 470PF 1KV 10% B	C024
040040154711	CAP CER 470PF 1KV 10% B	C028
040040156811	CAP CER 680PF 1KV 10% BN	C604
040040171021	CAP CER 1NF 2KV 10% BN	C007
040040174711	CAP CER 470PF 2KV 10% BN	C602
040042041021	CAP CER 1NF 50V 10% SL	C147
040042041021	CAP CER 1NF 50V 10% SL	C407
040042041021	CAP CER 1NF 50V 10% SL	C416
040042041021	CAP CER 1NF 50V 10% SL	C417
040042041021	CAP CER 1NF 50V 10% SL	C620
040042042201	CAP CER 22PF 50V 10% CH	C102
040046151021	CAP CER 1NF 1KV 10% BN	C033
040046151021	CAP CER 1NF 1KV 10% BN	C611
040050151011	CAP CER 100PF 1KV 20% BN	C030
040070041021	CAP CER 1NF 50V +80-20% F	C844
040070041021	CAP CER 1NF 50V +80-20% F	C846
040070041021	CAP CER 1NF 50V +80-20% F	C902
040070041021	CAP CER 1NF 50V +80-20% F	C917
040070041021	CAP CER 1NF 50V +80-20% F	C944
040070041021	CAP CER 1NF 50V +80-20% F	C945
040070041021	CAP CER 1NF 50V +80-20% F	C117
040070041021	CAP CER 1NF 50V +80-20% F	C121
040070041021	CAP CER 1NF 50V +80-20% F	C122
040070041021	CAP CER 1NF 50V +80-20% F	C199
040070041021	CAP CER 1NF 50V +80-20% F	C623
040070041031	CAP CER 10NF 50V +80-20% F	C910
040070041031	CAP CER 10NF 50V +80-20% F	C911
040070041031	CAP CER 10NF 50V +80-20% F	C915
040070041031	CAP CER 10NF 50V +80-20% F	C946
040070041031	CAP CER 10NF 50V +80-20% F	C027
040070041031	CAP CER 10NF 50V +80-20% F	C129
040070041031	CAP CER 10NF 50V +80-20% F	C130

PART NO	COMPONENT	POS
040070042231	CAP CER 22NF 50V +80-20% F	C900
040070042231	CAP CER 22NF 50V +80-20% F	C901
040070042231	CAP CER 22NF 50V +80-20% F	C137
040070042231	CAP CER 22NF 50V +80-20% F	C142
040070044731	CAP CER 47NF 50V 20% D	C633
040071041041	CAP CER 100NF 50V +80-20% F	C903
040071041041	CAP CER 100NF 50V +80-20% F	C909
040071041041	CAP CER 100NF 50V +80-20% F	C916
040071041041	CAP CER 100NF 50V +80-20% F	C940
040071041041	CAP CER 100NF 50V +80-20% F	C036
040071041041	CAP CER 100NF 50V +80-20% F	C038
040071041041	CAP CER 100NF 50V +80-20% F	C040
040071041041	CAP CER 100NF 50V +80-20% F	C042
040071041041	CAP CER 100NF 50V +80-20% F	C120
040071041041	CAP CER 100NF 50V +80-20% F	C123
040071041041	CAP CER 100NF 50V +80-20% F	C124
040071041041	CAP CER 100NF 50V +80-20% F	C126
040071041041	CAP CER 100NF 50V +80-20% F	C138
040071041041	CAP CER 100NF 50V +80-20% F	C150
040071041041	CAP CER 100NF 50V +80-20% F	C151
040071041041	CAP CER 100NF 50V +80-20% F	C152
040071041041	CAP CER 100NF 50V +80-20% F	C153
040071041041	CAP CER 100NF 50V +80-20% F	C309
040071041041	CAP CER 100NF 50V +80-20% F	C314
040071041041	CAP CER 100NF 50V +80-20% F	C318
040071041041	CAP CER 100NF 50V +80-20% F	C321
040071041041	CAP CER 100NF 50V +80-20% F	C323
040071041041	CAP CER 100NF 50V +80-20% F	C325
040071041041	CAP CER 100NF 50V +80-20% F	C327
040071041041	CAP CER 100NF 50V +80-20% F	C330
040071041041	CAP CER 100NF 50V +80-20% F	C350
040071041041	CAP CER 100NF 50V +80-20% F	C401
040071041041	CAP CER 100NF 50V +80-20% F	C411
040151041051	CAP CER 100NF 50V 10% B	CALT
040151041051	CAP CER 100NF 50V 10% B	C160
040151041051	CAP CER 100NF 50V 10% B	C333
040151041051	CAP CER 100NF 50V 10% B	C415
040258764721	CAPCER4.7NF400VAC20%4KVSFYX1Y1	C014
042140161071	CAP ELECT 100MF 16V 20%	C939
042140161071	CAP ELECT 100MF 16V 20%	C320
042140164771	CAP ELECT 470MF 16V 20%	C037
042194504751	CAP ELECT 4.7MF 50V 20%	C146
042194504751	CAP ELECT 4.7MF 50V 20%	C192
042410252281	CAP ELECT 2200MF 25V 20%	C402
042414254761	CAP ELECT 47MF 25V 20%	C908
042414254761	CAP ELECT 47MF 25V 20%	C952

PART NO	COMPONENT	POS
042414254761	CAP ELECT 47MF 25V 20%	C953
042414254761	CAP ELECT 47MF 25V 20%	C954
042414254761	CAP ELECT 47MF 25V 20%	C955
042414254761	CAP ELECT 47MF 25V 20%	C011
042414254761	CAP ELECT 47MF 25V 20%	C035
042414254761	CAP ELECT 47MF 25V 20%	C119
042414254761	CAP ELECT 47MF 25V 20%	C322
042414254761	CAP ELECT 47MF 25V 20%	C331
042414631051	CAP ELECT 1MF 63V 20%	C139
042414631071	CAP ELECT 100MF 63V 20%	C627
042414861051	CAP ELECT 1MF 250V 20%	C615
042416351081	CAP ELECT 1000MF 35V 20% RSS	C626
042416501051	CAP ELECT 1MF 50V 20%	C813
042416501051	CAP ELECT 1MF 50V 20%	C814
042416501051	CAP ELECT 1MF 50V 20%	C920
042416501051	CAP ELECT 1MF 50V 20%	C921
042416501051	CAP ELECT 1MF 50V 20%	C922
042416501051	CAP ELECT 1MF 50V 20%	C923
042416501051	CAP ELECT 1MF 50V 20%	C012
042416501051	CAP ELECT 1MF 50V 20%	C032
042416501051	CAP ELECT 1MF 50V 20%	C128
042416501051	CAP ELECT 1MF 50V 20%	C132
042416501051	CAP ELECT 1MF 50V 20%	C139
042416501051	CAP ELECT 1MF 50V 20%	C305
042416501051	CAP ELECT 1MF 50V 20%	C403
042416502261	CAP ELECT 22MF 50V 20%	C026
042417162271	CAP ELECT 220MF 16V 20%	C919
042417162271	CAP ELECT 220MF 16V 20%	C031
042417162271	CAP ELECT 220MF 16V 20%	C039
042417163361	CAP ELECT 33MF 16V 20%	C156
042419834761	CAP ELECT 47MF 160V 20%	C025
042440251091	CAP ELECT 1000MF 25V 20% 10*20	C034
042440354771	CAP ELECT 470MF 35V 20%	C041
042440354771	CAP ELECT 470MF 35V 20%	C612
042440861061	CAP ELECT 10MF 250V 20%	C605
042440861061	CAP ELECT 10MF 250V 20%	C610
042440861061	CAP ELECT 10MF 250V 20%	C206
042446501061	CAP ELECT 10MF 50V 20%	C813
042446501061	CAP ELECT 10MF 50V 20%	C814
042446501061	CAP ELECT 10MF 50V 20%	C904
042446501061	CAP ELECT 10MF 50V 20%	C914
042446501061	CAP ELECT 10MF 50V 20%	C935
042446501061	CAP ELECT 10MF 50V 20%	C104
042446501061	CAP ELECT 10MF 50V 20%	C107
042446501061	CAP ELECT 10MF 50V 20%	C109
042446501061	CAP ELECT 10MF 50V 20%	C140

PART NO	COMPONENT	POS
042446501061	CAP ELECT 10MF 50V 20%	C154
042446501061	CAP ELECT 10MF 50V 20%	C306
042446501061	CAP ELECT 10MF 50V 20%	C307
042446502251	CAP ELECT 2.2MF 50V 20%	C136
042446502251	CAP ELECT 2.2MF 50V 20%	C141
042446502251	CAP ELECT 2.2MF 50V 20%	C308
042446502251	CAP ELECT 2.2MF 50V 20%	C625
042446862251	CAP ELECT 2.2MF 250V 20%	C208
042449502271	CAP ELECT 220MF 50V 20%	C628
042719901071	CAP ELECT 100MF400V20% SNAP-IN	C005
045000000751	IC TDA9840-2Y STEREODUALPROCES	I901
045000000961	IC TDA6103Q RGB OUTPUT AMP.	I201
045000000981	IC TDA7057AQ 2X5W STEREO AMP.	I402
045000001021	IC TDA3653B VERTICAL DEFLECTIO	I601
045000001031	IC TDA4665 DELAY LINE P/S	I102
045000001041	IC PCF8598C-2 EEPROM PHILIPS	I302
045000001371	IC TDA9860 AUDIO PROCESSOR	I950
045000001421	IC TDA4605-3 SMPS CONTROLLER	I001
045100080301	IC TBA120U SIF AMP.DEMOD.	I900
045190083791	IC TDA8361-5Y PAL SIG. PROCES.	I101
045191000111	IC SAA5552M3A P10-A PT11 TELRA	I301
045238103051	IC LM317 1.5A ADJ V REG TO-220	I003
045238103081	IC LM7805 5V1A VOLT REG TO-220	I002
045500001151	IC 74HCT241P	I303
046000000141	TRS.BU2508DF SOT-199	Q602
046000022101	TRS.PH2369 TO-92	Q301
046246022281	TRS.BC547B TO-92	Q950
046246022281	TRS.BC547B TO-92	Q951
046246022281	TRS.BC547B TO-92	Q952
046246022281	TRS.BC547B TO-92	Q953
046246022281	TRS.BC547B TO-92	Q020
046246022281	TRS.BC547B TO-92	Q021
046246022281	TRS.BC547B TO-92	Q101
046246022281	TRS.BC547B TO-92	Q103
046246022281	TRS.BC547B TO-92	Q107
046246022281	TRS.BC547B TO-92	Q108
046246022281	TRS.BC547B TO-92	Q305
046246022281	TRS.BC547B TO-92	Q307
046246022281	TRS.BC547B TO-92	Q308
046246022281	TRS.BC547B TO-92	Q311
046246022281	TRS.BC547B TO-92	Q490
046246022281	TRS.BC547B TO-92	Q491
046246022281	TRS.BC547B TO-92	Q651
046246022281	TRS.BC547B TO-92	Q652
046924114001	TRS.BF422 TO-92	Q601
046926265281	TRS.BC556B TO-92	Q309

PART NO	COMPONENT	POS
046926265281	TRS.BC556B TO-92	Q310
046933000041	TRS.MOSFET PT CHASSIS	Q001
048000000011	DIODE RECT.BYD33D SOD-81	D006
048000000011	DIODE RECT.BYD33D SOD-81	D007
048000000011	DIODE RECT.BYD33D SOD-81	D610
048000000021	DIODE RECT.BYV95C SOD-57	D005
048000000021	DIODE RECT.BYV95C SOD-57	D020
048000000021	DIODE RECT.BYV95C SOD-57	D021
048000000021	DIODE RECT.BYV95C SOD-57	D022
048000000021	DIODE RECT.BYV95C SOD-57	D601
048000000021	DIODE RECT.BYV95C SOD-57	D602
048000000021	DIODE RECT.BYV95C SOD-57	D603
048100000041	DIODE ZNR.2V7 BZX55C DO-35	D460
048100255121	DIODE ZNR.3V6 BZX55C DO-35	D313
048210200001	DIODE SCHTKY BAT85 DO-34	D394
048210200001	DIODE SCHTKY BAT85 DO-34	D395
048210200001	DIODE SCHTKY BAT85 DO-34	D396
048210411001	DIODE GP.1N4148 DO-35	D107
048210411001	DIODE GP.1N4148 DO-35	D316
048210411001	DIODE GP.1N4148 DO-35	D321
048210411001	DIODE GP.1N4148 DO-35	D393
048210411001	DIODE GP.1N4148 DO-35	D401
048210411001	DIODE GP.1N4148 DO-35	D612
048320605201	DIODE ZNR.12V BZX55C DO-35	D015
048321423201	DIODE RECT.1N4007 DO-41	D001
048321423201	DIODE RECT.1N4007 DO-41	D002
048321423201	DIODE RECT.1N4007 DO-41	D003
048321423201	DIODE RECT.1N4007 DO-41	D004
048321423201	DIODE RECT.1N4007 DO-41	D202
048326428001	DIODE RECT.BYW72 SOD-64	D023
048540733021	DIODE ZNR.33V ZTK33B DO-35	D014
048542613621	DIODE ZNR.6V2 BZX55C DO-35	D010
048548637001	DIODE ZNR.9V1 BZX55C DO-35	D013
048773809001	DIODE LED KLR114L RED 5MM	D300
049030000091	CRYSTAL 12.000 MHZ HC49U	X301
049030000151	CRYSTAL 10.000 MHZ HC49U	X900
049030000501	CRYSTAL 4.433619 MHZ HC49U	X102
065001009200	INSTRUCTION MANUAL KOLAY TEVION 5530VT	
066010007980	CARTOON BOX TEVION 5530VT	
066022750370	NAYLON BAG 262*340MM CROMA	
067310001821	FUSE 2A 250V 5X20MM TIME-LAG	F001
070552111291	CRT 21'(A51JSY63X13)SEG-HITCH	
075016420011	SOCKET HEADPHONE STR	FS07
075020800031	SOCKET CRT NARROW NECK 29MM	S203
075030211001	CONN 2P VRT W/LOCK 5MM VERT	S602
075030261001	CONN 2P VRT W/LOCK10MM HRZMAIN	S601

PART NO	COMPONENT	POS
075030311021	CONN 3P IN-LINE VRT W/LOCK	S903
075030311021	CONN 3P IN-LINE VRT W/LOCK	S904
075030311021	CONN 3P IN-LINE VRT W/LOCK	S303
075030411001	CONN.4P IN-LINE VRT W/LOCK	S401
075030411011	CONN 4P(3P)IN-LINE VRT W/LOCK	S603
075030411011	CONN 4P(3P)IN-LINE VRT W/LOCK	S201
075030511001	CONN 5P IN-LINE VRT W/LOCK	S103
075030511001	CONN 5P IN-LINE VRT W/LOCK	S202
075040210011	SOCKET SCART 14'/20'/21'COMMON	S651
075100210020	CONN 2P VRT W/O LOCK 9.3MM	S002
075100211781	CONN 2P VRT W/LOCK 7.5MM DEG	S001
075110211030	FUSE HOLDER TK-79/B BLACK	F001
075110921021	CONN 9F PIN STRIPS	S901
075110921021	CONN 9F PIN STRIPS	S902
081000590001	SWITCH POWER S-95	SW10
081101114021	SWITCH TACT SKHHLN MTLCONT6*6	SW01
081101114021	SWITCH TACT SKHHLN MTLCONT6*6	SW02
081101114021	SWITCH TACT SKHHLN MTLCONT6*6	SW03
081101114021	SWITCH TACT SKHHLN MTLCONT6*6	SW04
399593000060	BATTERY 1.5V AAA GREENLINE	
602300033051	TRF.HRZ.DRIVE AT-ETH-20Y20BY	T602
602470003401	TRF.SMPS 14'20'21 PT (12V)	T002
604200000331	TRF.FBT 14/20/21PT COMMONFOCUS	T601
608000000011	COIL 10UH 10% 0.16A AXIAL FIX	L654
608000000011	COIL 10UH 10% 0.16A AXIAL FIX	L655
608000000021	COIL 10UH 5% 0.16A AXIAL FIXED	L101
608000000021	COIL 10UH 5% 0.16A AXIAL FIXED	L102
608000000021	COIL 10UH 5% 0.16A AXIAL FIXED	L105
608000000071	COIL 3.3UH 5% 0.21A AXIAL FIX	L232
608000000071	COIL 3.3UH 5% 0.21A AXIAL FIX	L233
608000000071	COIL 3.3UH 5% 0.21A AXIAL FIX	L234
608000000071	COIL 3.3UH 5% 0.21A AXIAL FIX	L300
608000000071	COIL 3.3UH 5% 0.21A AXIAL FIX	1077
608080000191	COIL 8.2UH 5% 0.165A AXIAL FIX	L900
608080000191	COIL 8.2UH 5% 0.165A AXIAL FIX	L103
608080000191	COIL 8.2UH 5% 0.165A AXIAL FIX	L652
608280001611	COIL VARIABLE 5.7MHZ Q90 180PF	L101
608280001881	COIL VARIABLE 38.9MHZ 100PF	L107
608280001931	COIL METALCASE 2.5MH	L902
608380002361	COIL CHOKE 150UH 10% 0.8A DC	L020
608580003420	COIL DEGAUSSING 21'CPT(9R PTC)	
608980000111	COIL 1UH 5% 0.27A AXIAL FIXED	L104
608980000111	COIL 1UH 5% 0.27A AXIAL FIXED	L230
608980003721	LINE FILTER 2*75MH ELF-18D615	T001
608980004051	COIL LINEARITY 50UH	L601
609330001131	PREAMPLIFIER TSOP1136	IR01

PART NO	COMPONENT	POS
610206612091	SPEAKER 8R 7W/10W 50/120MM	
611180011021	TRIMPOT 1K 0.1W 30% H-ADJ5/2.5	P202
611180011021	TRIMPOT 1K 0.1W 30% H-ADJ5/2.5	P204
611340014701	TRIMPOT 470R 0.1W30%H-ADJ5/2.5	P201
611340014701	TRIMPOT 470R 0.1W30%H-ADJ5/2.5	P203
611340014701	TRIMPOT 470R 0.1W30%H-ADJ5/2.5	P205
611380011031	TRIMPOT 10K 0.1W 30% V-ADJ 5/5	P901
611380011031	TRIMPOT 10K 0.1W 30% V-ADJ 5/5	P101
611380011031	TRIMPOT 10K 0.1W 30% V-ADJ 5/5	P102
611380012021	TRIMPOT 2K 0.1W 30% V-ADJ 5/5	P001
611380015011	TRIMPOT 500R 0.1W30% V-ADJ 5/5	P602
611380015021	TRIMPOT 5K 0.1W 30% V-ADJ 5/5	P601
616800020171	TUNER WSP	TU01
618003023601	CAP KP 33NF 630V 5% 15MM	C006
618004001021	CAP KT 1NF 50V 10%	C101
618008127211	CAPMKP 7.2NF1.6KV2.5%22.5/15MM	C607
618013011031	CAP KT 10NF 50V 5% 5MM	C113
618014006821	CAP KT 6.8NF 50V 10% 5MM	C929
618014006821	CAP KT 6.8NF 50V 10% 5MM	C937
618014006821	CAP KT 6.8NF 50V 10% 5MM	C009
618024004721	CAP KT 4.7NF 100V 10% 5MM	C125
618024004721	CAP KT 4.7NF 100V 10% 5MM	C131
619202003611	CAP KP 3.6NF 50V 2% 5MM	C918
620003051041	CAP MKT 100NF 250VDC 10% 15MM	C204
620004003321	CAP MKT 3.3NF 100V 10% 5MM	C949
620004003331	CAP MKT 33NF 100V 10% 5MM	C928
620004003331	CAP MKT 33NF 100V 10% 5MM	C936
620004071031	CAP KT 10NF 50V 10% 5MM	C133
620004072241	CAP MKT 220NF 63V 10% 5MM	C930
620004072241	CAP MKT 220NF 63V 10% 5MM	C931
620004072241	CAP MKT 220NF 63V 10% 5MM	C932
620004072241	CAP MKT 220NF 63V 10% 5MM	C938
620004072241	CAP MKT 220NF 63V 10% 5MM	C010
620004072241	CAP MKT 220NF 63V 10% 5MM	C304
620004072241	CAP MKT 220NF 63V 10% 5MM	C655
620004072241	CAP MKT 220NF 63V 10% 5MM	C205
620004083341	CAP MKT 330NF 63V 5% 5MM	C302
620005141041	CAP MKT 100NF 275VAC 20% RFIX2	C002
620013054741	CAP MKP 470NF 250VDC 5% 22.5MM	C606
620013054741	CAP MKP 470NF 250VDC 5% 22.5MM	C608
620013081041	CAP MKT 100NF 63V 5% 5MM	C950
620013081041	CAP MKT 100NF 63V 5% 5MM	C987
620013081041	CAP MKT 100NF 63V 5% 5MM	C105
620013081041	CAP MKT 100NF 63V 5% 5MM	C108
620013081041	CAP MKT 100NF 63V 5% 5MM	C110
620013081041	CAP MKT 100NF 63V 5% 5MM	C111

PART NO	COMPONENT	POS
320013081041	CAP MKT 100NF 63V 5% 5MM	C112
320013081041	CAP MKT 100NF 63V 5% 5MM	C114
320013081041	CAP MKT 100NF 63V 5% 5MM	C115
320013081041	CAP MKT 100NF 63V 5% 5MM	C116
320013081041	CAP MKT 100NF 63V 5% 5MM	C134
320013081041	CAP MKT 100NF 63V 5% 5MM	C303
320013081041	CAP MKT 100NF 63V 5% 5MM	C315
320013081041	CAP MKT 100NF 63V 5% 5MM	C316
320013081041	CAP MKT 100NF 63V 5% 5MM	C624
321003004731	CAP MKT 47NF 50V 5% 5MM	C609
321004001531	CAP KT 15NF 50V 10% 5MM	C926
321004001531	CAP KT 15NF 50V 10% 5MM	C927
321004003321	CAP KT 3.3NF 100V 10% 5MM	C013
321014064741	CAP MKT 470NF 275VAC 10% RFIX2	C001
331020038021	REMOTE CONTROL TM38/S2	
341100013859	MAIN CHASSIS FTXN-13PP11PBG GH HPH	9SKT
341108016900	COMPLETE POWER CABLE IHRAC	3KMP
341130013301	COMPLETE GERMAN STR.BOARD (TBA120U) PT-2	YSTR
341130013858	COMPLETE FRONT AV N-13 PT STR KLK	YFRN
341140013487	COMPLETE CRT SOCKET 20'21' PT SASE	1TUP
341200000000	LED PCB BLOCK B002,M002,M003	1LED
905102202590	FRONT CABIN PAINTED 21'NOVA-013	4KBN
905110141180	BACK COVER 20/21'NOVA PT	ARKP
905461003350	ACRY.WINDOW 20/21NOVA002/004/006/008	5AKR
966000040020	STRAPHOR 20-21' NOVA	STRH